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VIEWS, NEWS AND INTERVIEWS.

The electrical displays on the United States war ships at Kiel will be very fine, including the names of the vessels and patriotic emblems outlined in colored incandescent lamps.

The girls employed in telephone offices in Germany are said to receive only 60 cents a day.

As a result of the demand for platinum in electrical industries the Russian mines are now exporting about 7,200 pounds a year. The mines in the Ural district of Perm were actively worked as long as Russia coined platinum as money, but when the coinage was discontinued the price of platinum fell, the mines were closed and were not opened again until recently.

An Italian offered to make a trained bear he owned climb a telegraph pole in Hoboken, N. J., the other day, for 25 cents. A bystander put up the money and the Italian started the bear up the pole by belaboring it with a staff he carried. When the bear got to the top of the pole his muzzle became tangled in the wires and he was soon hanging in the air 20 feet from the ground. After an hour's work by several policemen and the Italian, the bear was persuaded to take hold of the pole again and climb down. This occurrence involves a high compliment to the linemen who strung the wires, for they did a good job.

"In Santa Rosa," remarked a commercial traveler to a San Francisco reporter, "the street railway company lives up to its public announcements: 'Every courtesy shown travelers on our lines.'

"The last time I was there the conductor stopped the car and sat down to read a newspaper.

"'What's the matter? Broke down?' I asked.

"'No; Joe Thomas wanted to collect a bill from a fellow in that shoe shop. He's owed it about three years and this is the first time Joe has seen him,' explained the conductor.

"The passenger returned in three minutes and we went a few blocks further, when the car stopped again.

"'What's up now? Another debtor in sight?' I asked.

"'Just a minute and we'll go. Henry Hopper and Charlie Hardin wanted to skake razzle-dazzle for a drink.'

"In the next block the conductor waited for Will. Keenan to buy a steak for dinner and lock up his blacksmith shop. It's an accommodating company."

Monsignor Satolli, papal delegate to the United States, was in New York city last week and visited the Duane street station of the Edison Electric Illuminating Company.

The Casino at Narragansett Pier has been provided with round marble tables, each shaded with a bright-hued Japanese umbrella. Electric lights are attached to the under side of each umbrella, and a novel effect is promised when the lights are glowing in the evening.

It is said that "the rays of the arc light have a decided therapeutic value," and that the arc unprotected by a glass globe is a very useful disinfecting agent. It is asserted that bad odors are dissipated by the direct rays, and that a real purifying action has been frequently observed.

Prince Henry, of Prussia, took an active part the other day in some Tesla high-tension experiments performed by Professor Spies in the lecture room of the scientific society, Urania, in Berlin. Professor Spies sent through the Prince's body a current of 100,000 volts and 10,000 alternations per second.

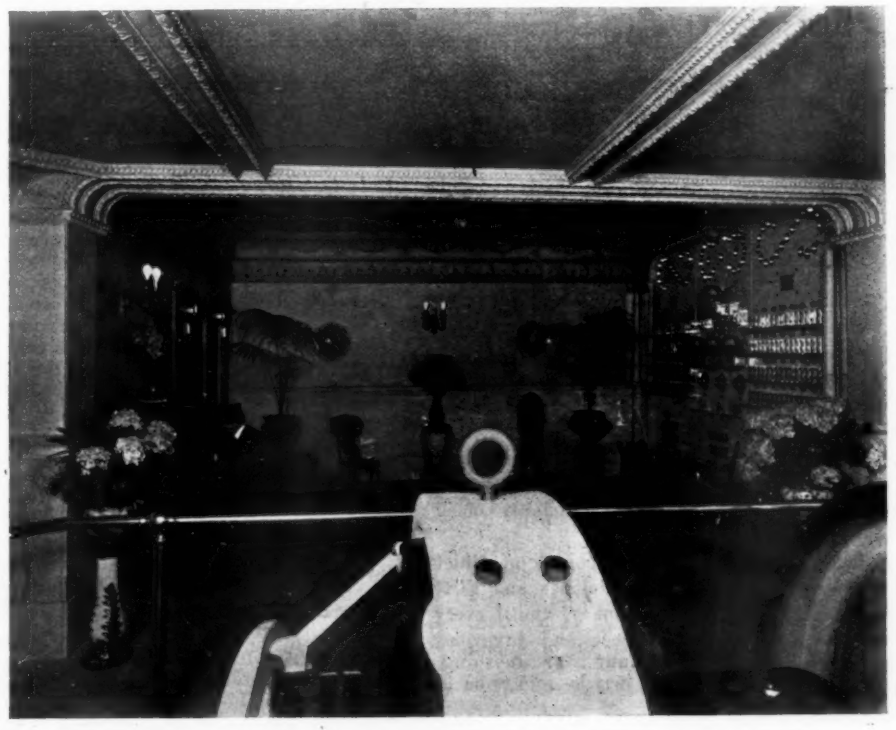


FIG. 1.—AN INTERIOR VIEW IN THE ARTISTIC DYNAMO AND ENGINE ROOM OF KEITH'S THEATER, BOSTON.

A PALATIAL DYNAMO AND ENGINE ROOM.

WHAT CAN BE DONE IN THE WAY OF AN ARTISTIC POWER ROOM.

When Keith's handsome new theater was opened in Boston last year, the ELECTRICAL REVIEW took occasion to speak of the lavish expenditure in the way of artistic effects, and particularly of the magnificence of the lighting and the novel and beautiful designs by which it was enhanced.

The artistic feature of electric lighting was probably never before so much sought for and its possibilities so thoroughly demonstrated as in this particular plant, and all who have seen it agree that the results fully warrant the efforts in this direction.

Following out these lines, the new engine and dynamo room, which has just been completed, is a marvel of beauty, and without doubt the finest thing of the kind in this country if not in the world.

The idea of an engine room, as generally conceived, is altogether at fault, and the elegance and artistic taste of the surroundings are more in keeping with a palace than an underground engine room 30 feet below the street level.

The illustrations presented herewith, and for which we are indebted to W. R. Fleming & Company, of Boston, will serve to give an idea of the interior, though far from doing it justice.

Visitors to this department of the theater, and they are many, reach it from the main entrance by passing down a flight of marble steps and along a marble paved corridor, with paneled wainscoting and tinted walls, to a reception room 20 feet square, opening into the engine room proper.

This room is both useful and ornamental, the furniture consisting of

a handsome mahogany desk and mahogany chairs, while imported jardinieres, hand-painted placques, an ornamental lamp on a brass onyx top table and artistic electroliers with opalescent globes, help to make up a very attractive interior.

The most striking feature of the room is a white marble switchboard of 10x12 feet, and flanked on each side by plate-glass mirrors and carved wood-work. The board was made and installed by the Thompson-Brown Electric Company, of Boston, from designs furnished by J. O. Heinz, Jr., their electrician, and contains all the most modern of switchboard appliances.

The stage board, which is also from the hands of the Thompson-Brown company, contains a number of placed swivels supporting hammered brass electroliers.

The steam connections are of the most improved kind and were especially designed for this plant. Both the connections and the foundations were erected under the supervision of the engineers of W. R. Fleming & Company and of Mr. Walter W. Jones, their eastern manager.

The furnishings of the engine room are in keeping with the rest of the appointments, and it is safe to say that in no other plant do the necessary tools and appliances have such luxurious settings. Separate oil trays and sets are furnished for each engine and rest on tables of hammered brass with onyx tops.

Another feature is the wrench case, which is of mahogany with a plate glass top. The wrenches themselves are nickel plated and rest on a velvet lining.

A mahogany roll top desk and mahogany chairs complete the outfit, and the rooms are thoroughly cooled and ventilated.

The plant is in charge of Chief Engineer George Melcher and First Assistant John Clancy, and if every possible convenience and luxurious surroundings count for anything, these gentlemen may be said to be in clover.

B. F. Keith certainly deserves great credit for the progressive steps in steam and electrical engineering, which his liberality has made possible, and is to be congratulated on possessing the finest theater in the matter of minute detail and artistic effects the world has ever seen.

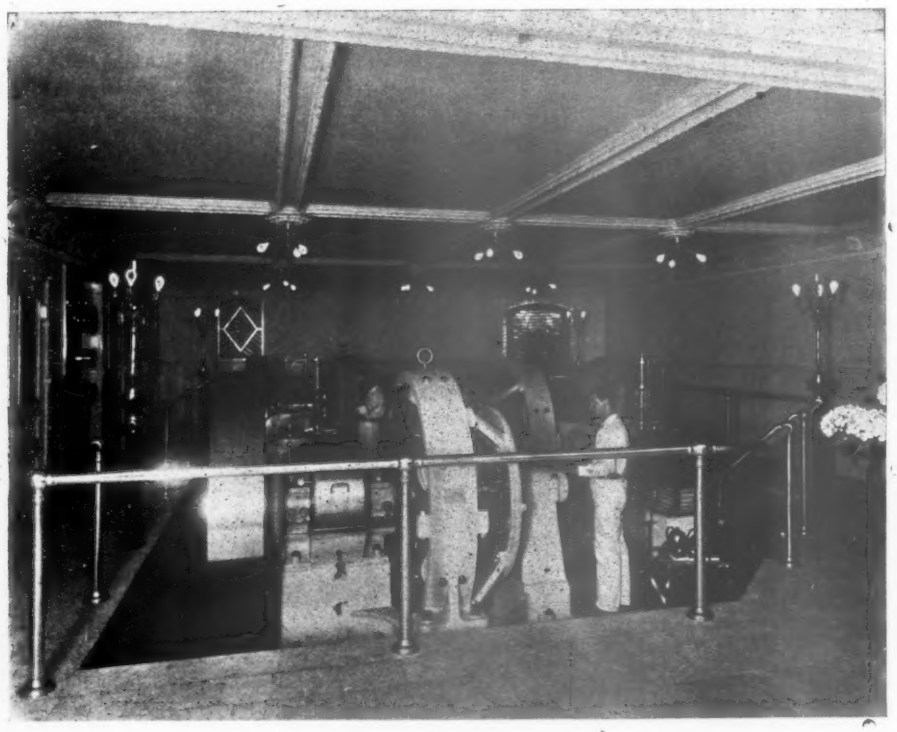


FIG. 2.—ANOTHER VIEW OF KEITH'S THEATER DYNAMO ROOM.

special features, whereby the most perfect stage effects are produced.

The engine room is fitted up in a similar style to the reception room, and contains three 150 horse-power "Ideal" automatic self-oiling engines, built by the Harrisburg Foundry and Machine Works at Harrisburg, Pa., and sold by W. R. Fleming & Company, engineers and contractors of Boston, New York and Philadelphia.

The cylinders are 15½ inches with a 14-inch stroke, and develop 150 horse-power at 270 revolutions under 80 pounds pressure. They are absolutely noiseless and without vibration, and contain everything of the most modern appliances in their construction.

Each engine is coupled direct to a 100-kilowatt General Electric multipolar dynamo, the entire floor space occupied by each unit being eight feet four inches by ten feet five inches.

The pit containing the machinery is two feet below the floor level, and is surrounded by a heavy nickel railing, along which at intervals are

Beginning with the July issue of the Chicago monthly, *Electrical Engineering*, established by Mr. Fred. DeLand, a new publisher takes hold of the magazine. He is Mr. Henry O. Shepard, a well-known publisher and president of the Inland Printer Company, of Chicago.

"THE PROJECTORS OF THE ATLANTIC CABLE."

ABSTRACT OF DR. CHAUNCEY M. DEPEW'S SPEECH AT THE PRESENTATION OF THE PAINTING TO THE NEW YORK CHAMBER OF COMMERCE.

A principal feature of the presentation to the New York Chamber of Commerce of the painting by Daniel Huntington, entitled "The Projectors of the Atlantic Cable," of which a superb reproduction was published in last week's ELECTRICAL REVIEW, was the speech of Dr. Chauncey M. Depew, the orator of the occasion. An abstract of Dr. Depew's remarks follows:

Mr. President and Gentlemen: The picture which is hung to-day upon the walls of the Chamber of Commerce illustrates one of the great events of history. The men, who are portrayed in it, are representative of American pluck and opportunity. Each of them, in his own way, did much for the commercial supremacy of the metropolis and the grandeur of the commerce of our country. They were, in the broadest and best sense, self-made men. They were not accidents, but architects. All commenced life without fortune or influence, with no other capital than character and brains, and winning power, fame and fortune.

The five gentlemen who gathered in Cyrus W. Field's parlor on March 10, 1854, were splendid examples of American success. Cyrus Field, the son of a Connecticut clergyman, who had naught to give his family but an education and an example, had retired from business with a fortune at 40. His brother, David Dudley, stood in the front rank of American lawyers, his codifications of law having secured national and international recognition. Marshall O. Roberts had ventured with equal success upon the ocean and upon the land. Wilson G. Hunt was a conservative, broad-minded and eminently successful New York merchant. Moses Taylor was one of the most far-sighted and eminent bankers of America. Peter Cooper had overcome almost insurmountable obstacles in his career, and at 90 years of age was still quick in his sympathy with the growth of his city, the development of his country, with the needs of mankind and with every effort for the education and assistance of the youth.

Before this assemblage Mr. Field placed the project of an Atlantic cable. The wire, which could be successfully laid under the ocean, had not yet been invented or manufactured. The possibilities of the construction of such a line had not been tested. The perils and obstacles between Europe and America and in the depths of ocean were unknown. The factors presented to these men of caution and of sense were a letter from Lieutenant Maury, of the United States Navy, expressing a belief in a level plateau under the ocean between Newfoundland and Ireland; a letter from Professor Morse, then radiant with the young fame of his successful telegraph, saying that, though it never had been tried, he yet believed a message could be transmitted through 3,000 miles of wire, and the enthusiasm and confidence of Cyrus W. Field.

"It will unite the Old World and the New, it will promote peace and civilization, it will help commerce, it will bring our country in contact with the world, and upon that I will stake my reputation, my undivided time and energies and my fortune," said Mr. Field. "This is more patriotism than business," was the answer of his guests, "but we will furnish the money required."

Before the laying of the cable could be commenced, the wires must be put under the Gulf of St. Lawrence, and stretched through 400 miles of unbroken wilderness, which had never been traversed by man, across Newfoundland to St. John's. As if upon a holiday excursion, the party sailed from New York, to lose their line in the Gulf of St. Lawrence, and returned chastened and dispirited. Again Mr. Field set forth, this time to complete his enterprise to the point where the connection could be made with the expected cable from Europe. He went abroad as a missionary in 1856, preaching the cable and its opportunities to English statesmen and bankers. There was no need of his arguing its value; that was thoroughly understood on both sides of the Atlantic.

The fleet was gathered. It left the coast of Ireland with its precious burden, speeded by cheers and salutes, to have the line break when 300 miles from the shore. Undaunted, undismayed, nerved with new energy by defeat, made of the stuff with which the world's conquerors have been endowed, Cyrus Field appealed once more to faltering friends on both sides of the water. Once more they responded. The United States and Great Britain contributed the best frigates of their navies. As a sign of the amity and concord which was to follow success, the American man-of-war steamed with her freight of coil toward the Emerald Isle, and the British man-of-war, with her half of it, toward America. Twelve hundred miles of wire had found a bed at the bottom of the ocean and been successfully tested, when once more the storms of the sea broke the cable, and every effort to recover it failed.

The indomitable pluck found in the Puritan strain spurred dying hope to one last effort and the cable was laid. President Buchanan sent his message to Queen Victoria and the Queen responded with equal cordiality and gratitude. The world was aflame with eager expectation

and joy. The builder came to our city a conqueror, to be welcomed with ovations and a triumph as significant, as grand and as national as any which ever hailed a Cæsar, with the world at his chariot wheels, entering Imperial Rome. The messages continued to fly back and forth. Then came the dramatic and tragic end. There were no hecatombs of dead, no wailing of wounded, no bereaved homes, but there was a wreck and destruction of hope involving more people and more countries than resulted from any other disaster of the ages. While the guns were booming, the torch lights flashing and the rockets bursting in air, on that very night the cable of 1858 ceased to work. The first shock over, the maddened populace, looking as ever for a victim, pursued the victor of yesterday as the fraud of the morrow. Torrents of invective and of epithet from the press, the exchanges and the public were poured upon the scheme and its author. "The cable had never worked; the messages were all false; we have been tricked and deceived for stock jobbing purposes," was the popular cry. To add to the troubles of the city's defeated and discredited guest, the financial cyclone which was then sweeping the country scattered his fortune.

Few strains in the blood of the human race, except that of Cromwell and his Ironsides, of Brewster and Carver and their companions, who framed the great charter of liberty in the cabin of the Mayflower, could have survived this trial, humiliation and disaster. But Cyrus Field arose from the wreck of his fortune, his hopes and his reputation with sturdier faith and sterner purpose. Forty times he crossed the seas. Congresses and Parliaments, the Cabinets of Presidents, and the Ministers of the Queen, Boards of Trade and Chambers of Commerce, the parlors of bankers and the directors' rooms of banks, the libraries of scientists and the moss-grown halls of ancient universities became familiar with this intrepid and irrepressible enthusiast. For eight long years he pursued his quest, exhibited his maps, submitted his tests, formulated his calculations and addressed his appeals. There is no human power which can resist the assaults of a man of genius energy and irrevocable purpose, who believes that he is right and is battling for a great cause. The great powers of the world, government and finance, surrendered to Cyrus Field in 1866.

The adventures and alarms, the machinery broken and repaired, the alternate hopes and despair, the forces of nature in the Atlantic working their mightiest against the domination of the skill, the invention, the will and the genius of man on the Great Eastern during the three weeks while the cable was paying out from her stern, and on either side of the ocean nations awaiting the result, presented pictures unequaled in all the marvelous stories which have aroused the eloquence, the poetry and the painting of the centuries in the marches and battles of history.

The first message on Morse's telegraph was the exclamation of wonder and thanksgiving, "What God hath wrought." The aspiration of the nations breathed simultaneously at the eastern and western ends of the Atlantic cable was, "Glory to God on high, and on earth peace and good will among men."

When in Genoa a year ago and looking upon that splendid statue of Columbus, which is its chief monument, I noticed upon the base this inscription: "There was one world. He said, 'Let there be two,' and there were two." After four centuries Mr. Field, with his cable, had reunited the two worlds, and in gladness and peace the earth was one.

A happy commentary upon the far-reaching influences and ultimate results of this quick communication between America and Europe was found among the first of the messages which flashed across the wire. This was the announcement of the agreement to submit the Alabama claims to arbitration. It was the beginning of that movement for the peace of the world by which the disputes of nations shall be settled, not by the arbitrament of arms, but by the calm procedure of judicial tribunals.

PERSONAL.

Mr. John L. Martin, a well-known electrical man of Chicago, was among the visitors to New York last week.

Mr. H. T. Paiste, the well-known switch manufacturer, of Philadelphia, sailed for Europe on June 15 for business and pleasure.

Mr. Frank Loney Perry, assistant business manager of the *Western Electrician*, and Miss Lucretia Faulkner will be married at the First Presbyterian Church, Chicago, on June 27. The ELECTRICAL REVIEW takes great pleasure in extending its felicitations on this happy event.

Mr. Arthur Duane Newton, general manager of the Eddy Electric Manufacturing Company, Windsor, Conn., and Miss Gertrude Hyde were married at Hartford, Conn., on June 12. Mr. Newton is one of the most popular men in the electrical business and the ELECTRICAL REVIEW joins his hosts of friends in wishing him and his bride full happiness.

Mr. H. H. Harrison, until recently with the White-Crosby Company, of Baltimore, has acquired an interest in the business of R. B. Corey, general sales agent for the General Incandescent Arc Light Company, of New York city. Mr. Harrison is very popular and has a large acquaintance among electrical men. The business will continue to be carried on under the same name, and Mr. Corey's offices in the Havemeyer Building will be enlarged. The ELECTRICAL REVIEW wishes Messrs. Corey and Harrison full success under their new arrangement.

ELECTRIC RAILWAY NOTES.

An electric railway will be built between Lowell and Reading, Mass.

Work has been commenced on the Passaic and Newark, N. J., Electric Railway.

The first electric locomotive for the Belt line tunnel has arrived at Baltimore.

The Syracuse, N. Y., Street Railroad Company has ordered fenders for its cars.

The Mayor of Norwalk, O., has ordered the electric cars there to be equipped with fenders.

The electrical equipment of the Pennsylvania Railroad's Mount Holly branch has been tested and found satisfactory.

The trolley road in Elizabeth, N. J., was formally opened on June 6. The first car for the public was started shortly after 11 o'clock.

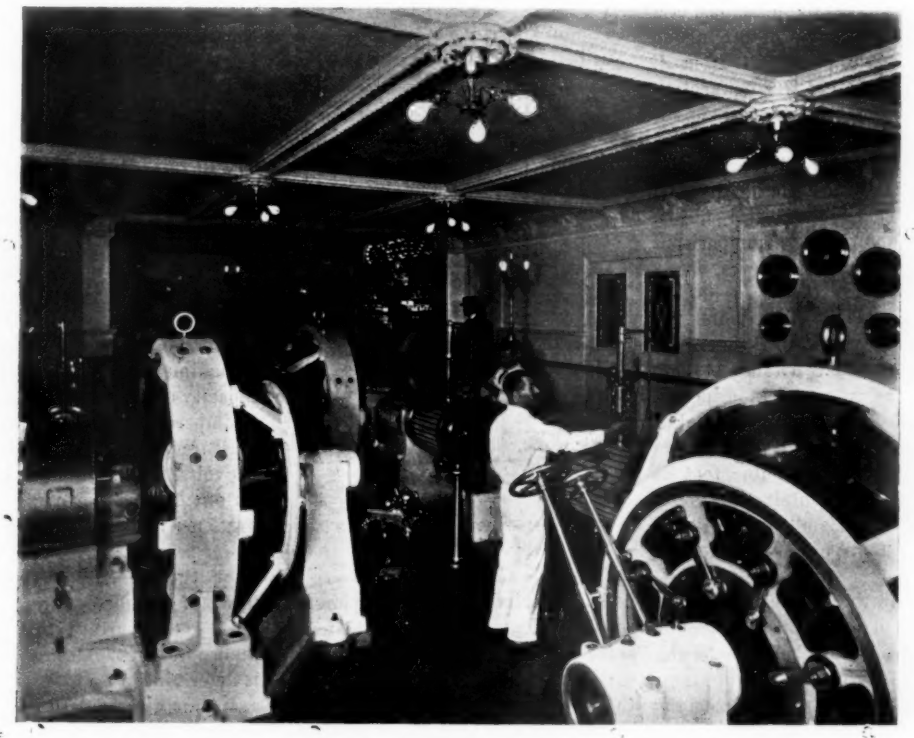


FIG. 3.—VIEW IN KEITH'S THEATER DYNAMO ROOM, BOSTON, SHOWING SWITCHBOARD.

The receivers of the Delaware Valley Electric Railway Company, at Stroudsburg, Pa., have failed to dispose of the road by private sale.

The property of the Union Street Railway Company, of Dover, N. H., will be sold by foreclosure sale in that city on July 6. No bid of less than $100,000 will be received.

The average gross earnings of the Consolidated Traction Company, of New Jersey, are reported to be $8,200 daily, expenses $6,000, leaving $2,200 per day applicable to the stock.

An electric railway between South Framingham and Milford, Mass., passing through Holliston, is assured. The latter town will be asked to grant $2,000 for repairing the highway over which the road will pass.

Work has been begun on a new electric road between Troy, N. Y., and Sand Lake, a distance of 10 miles. It is expected that the road will eventually become a connecting link with one of the New England systems.

D. Lamar, of New York, purchased the Ironton, Ohio, street railway a few weeks ago paying $2,000 down. As he failed to come to time with the balance of the money, the $2,000 was declared forfeited and the road will be offered for sale again.

An inventor of a street car fender, whose device was being tested on a Brooklyn, N. Y., trolley car, rushed into the street and stood in front of the car. He was successfully picked up unhurt, but a policeman arrested him for attempting suicide. He showed a permit from Mayor Schieren and was released.

Assistant Corporation Counsel Henry Yonge, of Brooklyn, N. Y., has issued a long statement of what he will do to the trolley companies if they do not comply with the ordinance requiring them to equip their cars with speed governors, indicators and fenders. The time allowed them will expire on June 20. Mr. Yonge believes that fining the companies under the ordinance will do no good, and that the only way is to restrain them from operating their cars unless they comply with the law.

The two great street railway systems of Kansas City on June 8 passed under one management. Several members of the old Metropolitan Street Railway Company's directory dropped out, and their places were filled by officers of the Kansas City Railway Company. The directory of the consolidated company, as it now stands, is as follows: C. F. Morse, Walton H. Holmes, George H. Nettleton, S. B. Armour, Wallace Pratt, C. F. Holmes, L. C. Krauthoff, E. J. Martyn and D. B. Holmes. Upon the filling of the directory, Mr. Walton H. Holmes was elected first vice-president and general manager, with full and absolute control and management of the entire system.

ELECTRICITY FOR MARINE PROPULSION.

BY PROFESSOR W. F. DURAND, IN "CASSIER'S MAGAZINE."

Ideal conditions in marine propulsion are evidently to be sought in a store of energy of such form that the maximum amount shall be embodied in the minimum weight and volume; in such a relation between this form and the motor or utilizing apparatus, that the maximum fraction may be rendered actually available for propulsive purposes, and in a motive apparatus of minimum weight and volume for the power developed.

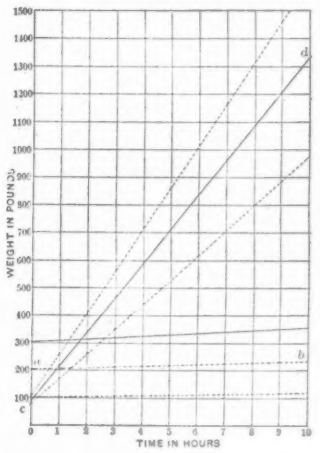
These considerations are purely of an engineering character. In addition, we have, as commercial considerations, the cost of energy delivered on board, and the first cost and cost of maintenance of the necessary machinery and equipment. Besides these there are a number of considerations relating to general adaptation, convenience for special purposes, etc. Any proposed scheme of propulsion must, as a whole, be judged from all of these standpoints in connection with the special circumstances of the case.

In order to compare electricity with steam, let us examine each method briefly under these several heads, using for quantitative comparisons such figures as shall seem fairly representative for the cases under consideration. We first note the weight and volume required for energy embodied in coal. Taking 14,000 heat units as potential in a pound of coal and 42 cubic feet bunker space per ton of 2 240 pounds, we readily find that one cubic foot of bunker space will contain about 53.3 pounds of coal, embodying about 580,000,000 foot-pounds of potential energy.

For comparative purposes we shall consider the utilization as the amount delivered to the screw shaft. Under the usual conditions of marine propulsion this may be taken at from five to eight per cent. As convenient units of power and work we shall take the horse-power and the horse-power per hour. We thus find that the work unit potential in coal requires about 0.18 pound mass and occupies about 0.0034 cubic foot of bunker space, while, with six per cent efficiency, the same unit at the shaft will require three pounds of coal and 0.056 cubic foot of bunker space.

Turning now to the weight of motive machinery, we shall find most cases included between limits of 100 and 300 pounds per indicated horse-power. These limits would be only slightly increased by referring the weight to shaft horse-power rather than indicated, and we may take 200 pounds as fairly representative for the weight of total machinery per shaft-power unit. As to the volume required for the machinery, it is difficult to give figures which are even approximate. Comparisons under this head between the two methods of propulsion will, however, be made further on.

In addition to coal and machinery, there will be required on board certain stores or supplies directly necessary for the development of the power. These may include fresh water, oil, waste, spare and emergency parts, etc. Water is perhaps the chief item, especially for salt water navigation with small craft, and, in any event, is the chief item of difference between the two methods of propulsion. Its amount we may take at one pound per work unit. Turning next to commercial considerations, we will take coal at $4 per ton of 2,240 pounds. It results that one work unit embodies in coal will cost 0.032 cent, while to develop the same amount of work on the shaft the coal will cost 0.53 cent. With regard to the cost of engines and boilers, there is, of course, the widest range of values. In order to take a definite figure, we will assume $40 per shaft-power unit, exclusive of the shaft and propeller. The cost of maintenance of engines and



WEIGHT DIAGRAM OF STEAM AND ELECTRICAL MACHINERY.

boilers, including their repairs, is so dependent on special circumstances that no definite estimate can be made. Comparisons under this head will, however, be noted at a later point.

We come now to the question of similar considerations for the electrical scheme of propulsion, which we may examine under the two heads of (1) batteries and (2) motor. The energy is embodied in the first in a potential form, in a manner somewhat like that in which it exists, due to the relation between carbon and oxygen, in the case of coal. There is this difference, however, that in the latter case the material which serves for the embodiment of the energy is consumed, as we term it, and the products of the process of liberation escape and can be used no more.

With storage batteries, on the contrary, the liberation of the energy does not result in the destruction of the battery or its contents. The operations are, with slight reserve, reversible, and it follows that the battery may be repeatedly used for the storage of energy in a manner somewhat analogous to that involved in the storage of energy by the winding up of a weight, or by the compression of a spring. As implied above, however, certain minor actions of the storage battery are non-reversible, and in this way, as well as in others of a more mechanical nature, an element of wear is manifest. The fact that the battery is not itself consumed as the energy is liberated may seem to suggest its similarity with the boiler or furnace in which the energy of the coal is made manifest, and which, itself, is not consumed. This analogy is, in a measure, correct, but it fails at a point very important for marine purposes. The difference arises from the fact that the boiler or furnace has nothing to do with the original embodiment of the energy, but only with its liberation and transformation. The size of the boiler will depend, therefore, on how much power is needed, but not, except indirectly, on the length of time for which such power is required. On the other hand, the size of battery must necessarily depend on the total amount of energy required and, therefore, jointly, on the power and the time. It follows that, so far as weight on board is concerned, the battery is analogous to the coal; while, in cost of maintenance, the cost of charging is analogous to that of the coal, and, in deterioration, the battery and boiler may be considered as analogous. Turning, next, to the motor, we find an exact analogy with the engine.

We have now to consider the weight of storage battery necessary to the embodiment of the work unit. The capacity of batteries is usually stated in ampere hours and, if the average pressure during discharge is taken at 1.9 volts, it follows that one ampere for one hour is the equivalent of 1.9 watts per hour, or to 1.9 ÷ 746 horse-power per hour. We may thus determine the capacity of the battery in terms of the horse-power per hour as unit. Comparing this with the known weight the desired relationship is determined.

In this way we determine that lead storage cells, as now constructed, usually weigh from 90 to 150 pounds per work unit embodied. With the very lightest possible type of construction it seems possible to reduce these figures to perhaps 60 or 70 pounds as a minimum. The greater care necessary in the construction of such cells, however, as well as their shorter life, both point to a higher figure as the lowest permissible for practical work. As a definite figure for comparative purposes we will take 100 pounds. With regard to the volume necessary for the embodiment of the work unit, we find, in a similar way, that, with usual modes of construction, from about 0.6 to 1 cubic foot will be required.

Taking up, next, the question of efficiency, we find naturally some variation with different types of motor, and with varying rates of output and other circumstances. Most cases will fall, however, between 75 and 85 per cent, and we may take 80 per cent as a fair value. It follows that the development of one work-unit at the shaft will require about 125 pounds of battery, occupying about one cubic foot of space.

Turning to motors, we find a considerable range of weight per power-unit. As with steam engines, we find also that, in general, large motors are lighter per power-unit than small ones, and high-speed lighter than low-speed ones. For motors of from five to 50 horse-power present construction gives about 75 or 100 pounds as the minimum weight per power-unit on the armature or screw shaft.

With regard to the relative amounts of space required for the engine and boiler on one hand and the electric motor on the other, we know that in the former case the entire machinery is found to require a considerable portion of the valuable internal volume of the boat, including usually an entire section for a certain length fore and aft. With the electric motor the weight itself is less, and the design is so compact that the volume occupied is almost inappreciable. In fact, it is usually so small that otherwise unavailable space in the stern or bilge will be found ample for its accommodation.

Turning now to the commercial features of electrical propulsion, we find that a fair value for the cost of energy stored in batteries is about three cents per work-unit of battery output, or about 3.75 cents per work-unit on the shaft. Comparing this with the cost of coal, we find that energy in batteries is about 100 times as expensive as energy in coal. Owing to the superior efficiency of the electric motor, however, this ratio becomes reduced to about seven when we compare equal amounts of work delivered to the shaft.

The causes of this great difference in cost are chiefly two in number: (1) The intervention between the steam engine and screw shaft of a dynamo, battery, motor, wiring, etc., thus causing a loss of energy and necessitating the consumption of about twice as much coal for the production of a work-unit at the shaft with the electrical machinery, as with steam machinery of about equal efficiency but coupled direct. (2) The interest and maintenance charges on this intermediate machinery. It appears, therefore, that while we may consider coal as a natural product, energy embodied in storage batteries must be considered as an artificial product, standing at the end of a series of transformations, in all of which more or less energy is lost, and requiring the operation and maintenance of expensive machinery.

For the first cost of storage batteries we may take $6 per 100 ampere hours as a representative figure. On this basis the cost per work-unit of battery output would be about $23.50, and per work-unit at the shaft about $30. The cost of motors in such sizes as would be appropriate to the propulsion of launches and small yachts may be taken at $30 to $50 per horse-power on the shaft.

(To be continued.)

Mr. Henry F. Kellogg, of W. B. Southgate & Company, Boston, was in New York last week.

UNITED STATES CIRCUIT COURT OF APPEALS FOR THE FIRST CIRCUIT.

*AMERICAN BELL TELEPHONE COMPANY ET AL., DEFENDANTS, APPELLANTS, VS. UNITED STATES OF AMERICA, COMPLAINANTS, APPELLEES.—APPEAL FROM THE CIRCUIT COURT FOR THE DISTRICT OF MASSACHUSETTS.—BEFORE COLT, PUTNAM AND NELSON, JJ.—OPINION OF THE COURT.—MAY 18, 1895.

Putnam, J.: This is a bill in equity, filed February 9, 1893, signed in behalf of the United States by its Attorney General, against the American Bell Telephone Company and Emile Berliner, containing a prayer in the alternative touching patent issued November 17, 1891, numbered 463,569, to the American Bell Telephone Company as assignee of Berliner. The alternative prayer is, that the patent be in all things recalled, repealed and decreed absolutely null, but that, if the patent is not deserving to be wholly repealed, but is repealable in part, a decree be made repealing only such parts as the court shall deem to be repealable. As to the latter part of this alternative prayer for relief, the court has heard nothing, and there is no occasion to consider it.

The bill contains enough on its face and in its frame, and in its signature by the Attorney-General to bring it within United States *vs.* American Bell Telephone Company, 128 U. S., 351; but in the development of the proofs all allegations of affirmative or positive fraud dropped out, so United States *vs.* American Bell Telephone Company fails to reach the merits of the cause at bar.

Berliner's original application was filed June 4, 1877, and patent 463,569 was issued more than fourteen years thereafter. This patent is sufficiently described for the purposes of this case by saying in a general way that it covers the microphone. In addition to this the American Bell Telephone Company, as assignee of Berliner, holds, or held, a patent issued to Berliner, November 2, 1880, numbered 233,969. It is represented that the patent of November 2, 1880, was a divisional one, growing out of the same original application which supports patent 463,569. It is also represented that this patent covers the invention described and claimed in patent 463,569, under such circumstances that the latter comes within Miller *vs.* Eagle Manufacturing Company, 151 U. S., 186.

The pith of the case, as stated briefly by the counsel for the United States, is:

1. That patent 463,569 is void for illegal delay in its issue, and

2. That it is also void on the ground that the prior patent, 233,969, "was granted upon the same application to the same applicant for the same invention."

Each proposition will be stated hereafter more fully, and in the precise form in which it came to the court.

Berliner having no interest need not be further noticed by us.

As to the first ground of proceeding the case is found in the following extracts from the bill:

On June 4, 1877, said Emile Berliner, * * * * filed in the Patent Office of the United States an application, executed in due form, asking a grant of Letters Patent for certain improvements in combined telegraph and telephone. * * * * Upon said application such proceedings were had in the Patent Office that on November 17, 1891, a patent numbered 463,569 was issued to the respondent, the American Bell Telephone Company, as assignee of said Emile Berliner, * * * * the title to which patent remains and is now in said American Bell Telephone Company as owner of the entire interest therein. * * * * And your orator alleges that said patent was unlawfully obtained by said respondent, the American Bell Telephone Company, and unlawfully issued by the Commissioner of Patents, and is an illegal grant, and ought of right to be annulled for reasons which are hereinafter set forth; and as an act of duty and justice towards the citizens of the United States, all whose rights and privileges are unlawfully and unjustly abridged by said patent, your orator brings this bill for the repeal thereof. * * * * Your orator shows further on information and belief that after the filing of the application aforesaid by said Berliner, and at some time prior to October 25, 1878, said Berliner sold the invention described in said application and his right to a patent therefor to one of the predecessors and grantors of the respondent company aforesaid, viz.: either to said Bell Telephone Company or said National Bell Telephone Company (corporations organized under the laws of Massachusetts), or both, the precise fact in this regard being unknown to your orator. * * * * And your orator avers further that the broad claims of said patent, 463,569, cover in their scope every form of constant contact telephonic transmitter which it is possible to make. * * * * And pointing out the circumstance * * * * * that from the time of acquiring title to the invention of said Berliner, as aforesaid, until the issue of said patent 463,569, said respondent company and its predecessor or predecessors had control of said application of said Berliner, and at the same time owned the inventions and patents of Blake, Berliner, and others, under which it was enjoying a monopoly of the use of the broad invention of the constant contact telephonic transmitter, your orator avers that there rested upon said respondent company an extraordinary duty to speed said application by every means known to the law, and that if by any act or omission of said company the issue of said patent 463,569 was to any extent delayed beyond the date when it might have been issued (if it could of right be issued at all), such delay ought to and does invalidate said patent.

And your orator expressly charges that, so far from performing that duty, said respondent company, by a course of conduct which is hereinafter in part set forth in detail, designedly, and with intent thereby to prolong its monopoly aforesaid, delayed and prolonged the pendency of said application for more than 13 years after it obtained control of the same as aforesaid.

Then follow various allegations stating in detail the delay in the progress of the application before June 9, 1882. These we omit, because the counsel for the United States now admit that no point is made for that period.

Then come the following:

Your orator shows further that it is advised that it is claimed and pretended by said respondent company that from and after about June 9, 1882, the progress of said application was delayed in the Patent Office by the pendency of other applications which interfered or might have interfered with the application of said Berliner, and that for that reason it was impossible for it to procure the issue of said patent 463,569 at an earlier date than that on which the same was issued; which your orator denies, however, to be true; and your orator in that behalf avers the truth to be, on information and belief, that, while after the year 1882 said application was embraced in one other interference, it need not have delayed the progress of said application to any substantial extent, because it was upon a minor feature of invention, which could have been separated by division from said broad claims of invention as other minor matters were, and further that it did in fact occupy in the aggregate only three months out of the nine years which elapsed after said last-mentioned date. And as to other pending applications which might or could have interfered with said application of said Berliner, your orator avers on information and belief that there were only two, of which one was an application by Thomas A Edison, which was owned and controlled by said respondent company itself, and the other an application filed by one Daniel Drawbaugh, July 26, 1880.

And your orator avers on information and belief that said application of said Drawbaugh was never, prior to the issue of said patent 463,569, completed or presented for allowance by the Patent Office in such form as to be allowable, independently of any interference with said application of said Berliner which could or might have been found to exist, and if, as said respondent company claims and pretends, the examiners of the Patent Office kept said patent 463,569 suspended from issue for nine years, waiting to see whether said Drawbaugh would present his application in such form as to warrant a declaration of interference between it and said application of said Berliner, such procedure on their part was contrary to law and the duty imposed on them, and it was within the power of the respondent company by timely and proper assertion of its rights before the Patent Office to terminate such unlawful delay and secure final action on said application. * * * * But your orator charges that said respondent company, being interested in prolonging such delay as aforesaid, countenanced and acquiesced in the inaction of the examiners of the Patent Office, and though it made at long intervals some pretenses on the record of a desire that said application should be taken up and acted upon, it did not during all that time bring the subject of the extraordinary delay in said proceedings to the knowledge of the Commissioner of Patents, or in any way challenge the right of the examiner to keep said application waiting year after year for a possible interference with some other application, or take any step whatever to promote the advance of said application; all of which course of conduct amounted, as your orator avers, to a consent and agreement on the part of said respondent company to the unlawful and unauthorized postponement of action on said application by the examiners of the Patent Office, and affects the said company with the same responsibility for said delay which would attach to it if the same had occurred by its express act instead of its express sufferance. * * * * Wherefore your orator says the wrong and injury perpetrated upon the people of the United States by the issue of said patent 463,569, 14 years after the application therefor, has come about by the design, machination and connivance of said respondent company, and by means of the abuse by it of the generosity and liberality of the government of the United States and the patent laws, and in justice and equity said company ought not to derive or receive any profit or advantage therefrom.

There is much additional matter bearing on these last propositions, but we have given enough to show this part of the case. There are also allegations that, prior to acquiring the invention of Berliner, the defendant corporation became the owner of the patent numbered 174,465, issued March 7, 1876, to Alexander Graham Bell, covering the transmission of sound by means of an undulatory current of electricity, and the same considered in The Telephone Cases, 126 U. S.; that patent 463,569, if valid, will continue without substantial diminution, during the full term thereof, the same close monopoly of the art of telephoning enjoyed under the patent to Bell; and that this is against justice and equity, and contrary to the plain spirit and intent of the patent laws. These are pointed out as circumstances on which the bill bases an alleged extraordinary duty of the defendant corporation to speed the Berliner application. If it were necessary to examine the motives of the American Bell Telephone Company, as bearing on a question of either positive or implied fraud, or on a question whether it did in fact speed the application of Berliner, and its purposes in relation thereto, these facts might become relevant as evidence, as might also the alleged great value of the microphone. But it is clear that all such allegations are irrelevant to the bill itself. So far as the law is concerned, the patent in suit is to be tested independently of the Bell patent. There can be but one law touching alleged delays in the progress of an application through the Patent Office, and touching the duty of applicants with reference thereto, whether the invention was from the outset seen to be valuable, or only afterwards proves to be so, or always remains of little account. To deny this is to deny that the laws are equal, and would furnish a standard for the determination of the rights of patentees too fickle and imaginative to form a proper basis for the use of a court of law. Therefore we have not set out these allegations as proper proportions of the bill, and do not deem it necessary to make further explanations in reference to them.

The following extracts from the answer of the American Bell Telephone Company sufficiently illustrate its defense on this point:

In and by that patent the United States, plaintiff herein, by its Secretary of the Interior, its Commissioner of Patents and its various other officers in its Patent Office, by it duly appointed, employed and empowered to make the grant and to make, conduct and supervise the examination and other proceedings which preceded it, announced and declared that it had found and adjudged that the said Berliner had duly presented a petition praying for the grant of a letters patent for the invention and improvement in said patent, and its said specification described, had assigned the same to this respondent, and that he and this respondent had complied with the various requirements of law in such case made and provided; and that, upon due examination made, the United States had adjudged said grantee to be justly entitled to said patent under the law. * * * * The United States, plaintiff herein, had, in fact, so adjudged by its duly authorized officers, after due, full, elaborate and complete examination touching each and all such matters. Each such examination and decision was made by the officers whom the plaintiff held out as having, and who actually had, jurisdiction to make that examination, and to determine, regulate, supervise and control the manner and form of the proceedings, and the whole conduct thereof. Those examinations and decisions were made with a full knowledge of all material facts; they included an actual consideration of all the objections set forth in said bill, and of the truth or falsity, and legal effect, of every matter therein alleged as matter of fact, and the patent was issued in consequence, and as the result of conclusions intelligently and deliberately reached upon such examination and adjudication. Its grant was not in any degree the consequence or result of any fraud, accident or mistake, as in said bill most falsely is alleged, or purports to be alleged, nor was there any violation of law, or error, in the proceedings upon which it was granted.

This respondent and said Berliner, in the initiation and in the prosecution of the application which resulted in said patent, and in all the proceedings with relation thereto, in all respects conformed to and complied with the various requirements of law in such case made and provided, did nothing which in law, justice or good conscience they ought not to have done, and omitted nothing which in law, justice or good conscience they ought to have done. All their respective statements and representations were intended by them, and were believed by them, respectively, to express the truth; they disclosed and communicated to the Patent Office everything which it was their duty to disclose or communicate; they did not conceal nor attempt to conceal from any official of the Patent Office anything which they were bound to communicate, or which they believed that it was material for him to know; they did not deceive or mislead any such official, nor did they attempt nor intend so to do; they did not take advantage of any ignorance of any such official nor attempt to do so, nor did they profit by any such ignorance or seek to. They did not commit any abuse of process, proceedings or forms of law, nor contrive, attempt nor intend so to do, and were not guilty of any fraud, concealment, imposition or false suggestion whatever. They did not practice nor attempt to practice any fraud, deceit, suppression or subterfuge, but in all respects conformed to law and to the highest good faith and honesty. * * * * Whether Berliner's application was pending for a longer time than was necessary or proper this respondent is not sufficiently informed to fully admit or deny, and, therefore, requires the plaintiff to produce proof thereof, if material. But this respondent did not, designedly, with intent to postpone the expiration of said patent and its rights thereunder, delay or prolong the pendency of the application, nor do any act tending to that end. Neither the pendency nor the progress of the application, nor the issue of the patent in suit, were delayed by any act, omission or slowness of either respondent. It never omitted to take promptly every action which it was incumbent on it take, or the taking of which it believed would hasten that issue. It never failed to prosecute the same promptly, and it used every means known to the law to speed the application, including applications to the commissioner in person as often as they seemed likely to result in speeding the case. It avers that the slowness alleged in the bill was the act of the plaintiff itself; neither respondent in any way contributed thereto by act or by omission; neither such delay, nor any action, inaction or slowness which caused it, or contributed to it, was in any way aided, promoted, due to, desired, intended, designed, contrived, countenanced, acquiesced in, or connived at by either of the respondents; and neither of them is responsible therefor, nor for the consequences and results thereof.

To the answer replication was duly filed and proofs taken. The cause was heard in the Circuit Court and there decided in favor of the United States, on each of the points we have briefly stated as being issues in the cause, from which appeal was duly taken to this court.

The case has been so thoroughly argued here on either side that the court has found little difficulty in apprehending it. We deem it prudent to refrain from determining ultimately any questions of fact, except so far as we find it necessary so to do in order to apply the rules of law to it.

The bill alleges, in portions of it which we have not cited, that Berliner's application was abandoned at one stage of the proceedings. In order to correctly estimate the issue under discussion it is necessary to note that this is not now relied on. The United States has somewhat variously stated its position, and our first duty is to understand precisely what it is. In the very lucid and careful opinion of the learned judge who heard this case in the Circuit Court, it is given in the following language:

The proposition is that the Bell company intentionally delayed the prosecution of the Berliner application, and the issue of the Berliner patent, for the purpose and with the result of prolonging their control of the art of telephony, which would cease with the expiration of the Bell patent in 1893; and that they did this by submitting to delays on the part of the officers of the Patent Office, which delays they, the Bell company, had it in their power to prevent, and refrained from preventing, for an unlawful purpose. This conduct is alleged to constitute a fraud practiced upon the public through the Commissioner of Patents and his assistants. And it is claimed that the patent so obtained by such fraud may be and should be annulled by the decree of the court, on the authority of United States *vs.* American Bell Telephone Company, 128 U. S., 315, because there is no substantial difference between a fraud practiced upon the commissioner as an agent of the public, and a fraud practiced upon the public with the commissioner's connivance or acquiescence.

This is far from precise. It uses the words "intentionally delayed," while it is necessarily conceded that there is no evidence to support that expression in its natural sense, and that the case comes down to a claim that the American Bell Telephone Company submitted to delays which it was in its power to prevent. The statement continues that it refrained from prevention for an unlawful purpose. The "unlawful purpose" is understood to mean expectation that its monopoly would be extended through the delays on the part of the Patent Office. This, in some aspects, it might well regard as advantageous; but to undertake to lay down a rule of law, or of fact, that acquiescence in the delay of a public official who is bound to perform a certain act, involves an unlawful purpose because it may result to the advantage of the applicant, omits an important element. If the applicant is under no obligation touching the delay, there is no rule of law by which it can be said that, because he may receive an incidental benefit therefrom, his purpose in relation thereto is unlawful. A man's motives will not make wrongful an act which, in itself, is not wrongful. This came directly in issue, and was so given by Chief Justice Jervis, in Heald *vs.* Carey, 11 C. B. 977, 993.

The proposition further states that there is no substantial difference between a fraud practiced upon a commissioner which is an injury to the public, and one practiced on the public with the commissioner's connivance and acquiescence. This is probably a true statement of the law, because either hypothesis involves positive and affirmative fraud of a public character. But of this there is no claim whatever in the case at bar as it now stands. We must, therefore, look somewhere else for an accurate statement of the position of the United States.

At the hearing at bar the propositions were that the American Bell Telephone Company owed the public some duty in the matter under consideration; that that duty is to be sought in the principle of legal ethics that every man is bound to enjoy his own in such a manner as not to interfere with a like enjoyment of their own by others; that if the exercise of the rights of the American Bell Telephone Company under the Berliner application was liable to work injury to the public, in a way foreseeable by the company, it was bound to take notice of that fact and conduct its proceedings in such a manner as to avoid that injury, if possible; that if this situation imposed any duty on the American Bell Telephone Company towards the public, it was a duty commensurate with the interests involved, and that no doctrine of reasonable diligence will reach the case unless reasonable diligence is held to be the utmost diligence; and that it owed the public an extraordinary duty in the matter, which could be discharged only by the greatest possible diligence in the prosecution of its application. It was further claimed that the delays set up in the bill were unwarrantable and illegal; that the attitude of the American Bell Telephone Company towards them was not only one of consent, but of interested consent, of acquiescence, of guilty connivance; that the commissioner was betraying his trust in permitting these delays; that it knew this and knew the practical effect of what he was doing; and that it was its duty to stir the commissioner to action instead of refraining from so doing. It was further said that if the American Bell Telephone Company had bribed the commissioner for holding Berliner's application from year to year for the purpose of prolonging its monopoly, this would plainly be a fraud on the public, through the commissioner; but that to reach the same result by an intentional reliance on his ignorance, incapacity and neglect of duty, instead of his cupidity, and by conduct in keeping with such reliance, the same injury results to the public, with only the degree less of moral heinousness of behavior on the part of the applicant. We ought to say that all these epithets charging the commissioner or any other officer of the Patent Office with any conscious violation or neglect of duty, or ignorance and incapacity, are unsupported by the proofs in the case, unless it can be claimed that they constitute the language which the law applies in consequence of delays which possibly might have been prevented by the public officials.

The United States having thus stated its position, we do not find ourselves required to recite the details of the proofs. It is enough to say that the case shows that all the allegations in the answer which we have quoted, are sustained, except only that we do not deem it necessary for the purposes of this case to determine fully the condition of the proofs on the proposition that there rested on the American Bell Telephone

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A BOSTON VIEW OF THE BERLINER DECISION.

A MORAL VICTORY FOR THE BELL COMPANY, BUT WHAT ELSE?

Now that the long-looked-for opinion on which the decision of the United States Circuit Court of Appeals was rendered, in the suit of the United States against the Bell Telephone Company for the annulment of the Berliner patent, has been handed down, those who have studied the text closely are wondering on what grounds a great victory for the Bell company was claimed and why so much talk was indulged in regarding the extended monopoly of telephone interests which this decision gave to the parent company.

The opinion as finally given to the expectant public is very voluminous and out of the mass of well turned phrases it is somewhat difficult at first sight to sift the real pith of the case; but as near as can be gathered at this writing it would appear that the court had been called upon to pass upon two questions; namely, a charge of fraud on the part of the Bell company, in willfully delaying the issuance of the patent, and again that the patent should be annulled on the ground of a prior patent being granted upon the same application to the same applicant for the same invention.

With the first of these questions the court has dealt plainly and explicitly, and the whole victory for the Bell company is condensed into this first clause.

It is a moral victory, pure and simple, the Court of Appeals relieving them from stigma cast upon them by Judge Carpenter, to a certain extent, although in rather a negative manner, by stating that the government had failed to prove its case.

However, the moral question being one for individual judgment, and having no bearing on the commercial features of the case, it is only fair that the Bell company should be given the full benefit of the opinion, and derive what comfort they can from it.

As to the great point at issue, the validity of the Berliner patent, the opinion first handed down virtually dodges the question, by claiming lack of jurisdiction by reason of statute provisions, and also that the action of the commissioner in granting the patent, even if erroneous, was entirely within the scope of his authority, and no mistake being proven, the court is unable to revise his action.

This certainly leaves the patent on file, but does it in any way strengthen it? If the Bell company felt it to be too weak to take action on before, do they consider it greatly bolstered up by this last decision?

It is true the Court of Appeals has refused to annul it, but will any circuit court in the country sustain it by granting an injunction on the strength of it? Such action would be extremely doubtful, to say the least.

On the whole it would seem that the infant telephone industries of the country are in no immediate danger from the Berliner "bogie," nor will the public, who are just beginning to feel the benefits of independent telephone ownership, and to appreciate them, readily relinquish what they have been so long in getting.

As before stated, the decision is a moral victory for the Bell company, and is no doubt appreciated by them as such; but as to being a death blow to other telephone industries, it is far from it, and the Bell people probably appreciate this fact also.

They are firmly established in their magnificent long-distance service, and to a large measure control the business of the big cities, but there are still little corners of the earth open to other companies, and it is well that it should be so.

An instance of how much value is placed on the recent so-called victory of the Bell Telephone Company, as embodied in the decision of the U. S. Court of Appeals which was rendered some three weeks ago, came to my notice this morning in the office of the National Telephone Company of this city. The National company have just received a large order from the Carnegie company of Pittsburgh for the equipment of their immense plant with National instruments, and it is fair to presume that a concern of this size is favored with the advice of eminent counsel in making their contracts. While talking with Mr. J. D. Leatherbee of the National company, a telegram was received from another prominent telephone concern in the West ordering 300 more instruments for immediate shipment. Both these orders were received after the hard fact of the decision in favor of the Bell company was made known and prior to the publication of the opinion on which it was based.

H. G. TUCKERMAN.

Boston, June 15.

We have received many compliments upon the half-tone reproduction of the painting, "The Projectors of the Atlantic Cable," which we published on page 311 of the ELECTRICAL REVIEW for June 12, 1895. We take considerable pride in this illustration, and direct attention to the beautiful effects of light and shade and the clear modeling of the faces.

The electrical industry may be said to be about 17 years of age. To-day it is safe to say that over $1,000,000,000 of capital is invested in it. The greater portion of this immense investment has been made since the electric railway motor was discovered to be a success in 1888.

We call the attention of our readers to the opinion of the United States Circuit Court of Appeals in the Berliner case, which is published in full in this issue of the ELECTRICAL REVIEW.

OPINION IN THE BERLINER CASE.

(*Continued from page 329.*)

Company an extraordinary duty to speed its application by every means known to the law, as alleged in the bill, or to exercise the greatest possible diligence, as claimed at the bar. Unless the case required this extreme diligence, there can be no just claim of an unlawful omission to act; and therefore there could not be the "unlawful purpose," because, as we have said, this does not result from a mere omission to do what the law does not require.

During the progress of the arguments the court anxiously looked for practical illustrations of what was meant by the high degree of diligence referred to, what practically could be done to satisfy its demands, and wherein, if accepted as necessary to relieve the applicant from the charge of a course of conduct unlawful or by implication fraudulent, it differed in its practical requirements from what was in fact done. The court failed to receive light in this direction; and it regards it as an answer to the proposition of the United States on this part of the case, that what it did obtain was a mass of theoretical propositions, which, if applied practically, might or might not have involved the case, in its progress through the Patent Office, in greater complications and difficulties than those which did in truth surround it. In other words, so far as the proofs go, the course of the application was in accordance with the usages of that office, and was such as the officials there, acting in good faith and according to their practical experience, determined at the time to be on the whole the best. What would have been the practical result of the theoretical courses suggested, with an application around which centered so much powerful hostility as gathered about this one, it is impossible to ascertain by any methods of determination given to the courts. If, instead of suggesting theories as to what might have been done, the United States could have pointed out among the usages of the Patent Office an existing pathway other than that which was adopted, we would have some rule by which to estimate what could have been done in the exercise of extraordinary diligence other than was done.

One proposition of the United States, illustrating generally what they say might have been done, we give in the exact terms stated to us at the bar:

> The duty of the Bell company was to get its patent with the least possible delay by the exercise of all its legal rights. Whatever it had a right to do to expedite an application in its own interest, it was in this case bound to do in the public interest. If a situation arose in which the commissioner was not doing his duty, and in which it would have had a right to challenge his conduct in its own interest, it was its duty to challenge his conduct in the public interest. Its submission in silence to delay directed by the commissioner in violation of his duty, was a failure in the discharge of its duty.

In its own interest the American Bell Telephone Company had a right to go to Congress for legislation touching the general course of proceedings in the Patent Office, as did the commissioner himself in 1889. It might have applied for the removal of subordinates for the purpose of substituting others who would attempt a more radical course of proceedings. It might have applied for the removal of the commissioner himself, and the appointment of a successor who would have turned his energies more in the direction of forwarding the application under discussion. It might have applied to the commissioner for a general revision of the rules of practice of the Patent Office. The imagination can hardly put a limit to the things it had a right to do. To say, therefore, that it was bound to do in the public interest all that it had right to do in its own, and that if it did not do this, it should pay the penalty of a forfeiture of an invention said to be extremely valuable, is a proposition so unreasonable that the mere statement of it by the United States seems to confess the weakness of their case.

Another suggestion of a general character in this same direction was made by the United States as follows:

> The officials of the Patent Office were guilty of gross dereliction of duty in their treatment of the Berliner application, but there is no reason to believe that anything would have been necessary to secure prompt and proper action by them except a fair, candid, full, strong and persistent presentation of the facts by the Bell company, with reasonably ingenious suggestions from it of ways of meeting the difficulties which were encountered in the progress of the application.

This is a merely negative proposition so far as it attempts to reach the defendant corporation, without specification, while the case requires an affirmative one with specifications and proofs. But the proposition is that there was on the part of these officials a gross dereliction of duty. Indeed, in the presentation of the case of the United States we have heard very much in censure of the public officials, clothed in the strongest epithets, of which we have already given some instances. We are compelled to say that if this record suggests any dereliction of official duty, it was in the form of a continued hostility to the American Bell Telephone Company, and of an indisposition to grant the application for the Berliner microphone, with a concurrent disposition to nurse and favor the Drawbaugh application, either for its own direct advantage, or for the purpose of defeating inventions controlled by the defendant corporation. Notwithstanding, as we have already said, the proofs do not convict the officials, they show enough to have warranted the American Bell Telephone Company in guarding itself against the possibility of such a disposition on their part during the period covered by the nine years between June 9, 1882, and the issuing of the patent now in dispute. Under these circumstances, and after the American Bell Telephone Company and its solicitors had performed the customary duties with reference to the forwarding of its application, including all those things required by statute, or by the Patent Office, the prompt performance of all which is conceded by the United States, it is not for a court of law to say that that corporation, as to all the unofficial methods which it might take, or might omit to take, for the advantage of its case, was not entitled to use its own judgment with reference to the methods and persistency of representation to public officers, especially those whom they had some reason to regard as unfriendly.

But there are more serious difficulties with this proposition. It relates, of course, to unofficial or informal solicitation, including personal interviews. So far as the presentation of the case was concerned, the proofs show that there was at least a reasonable and ordinary amount of this. But what the United States require, as we have already shown, was a high degree of zeal in this direction. Whether, however, the law's measure is that of reasonable diligence or the highest, the courts have no standard by which they can determine what amount of informal solicitation would have been proper, all the formal channels of communication having been occupied, as they were in this case, or what amount would have been permitted by the public officers concerned; nor is there anything in this record which affords proof to the court that informal solicitations beyond those which were actually used, would have been effective. It must be admitted that it is not only necessary for the United States to prove that there was a lack in this direction, but that the lack contributed to the result. The court might guess that additional informal solicitations would have advanced the application, or, perhaps, have retarded it; but there is no proof which enables us to form proper judicial conclusions on this point. If the record showed that the American Bell Telephone Company had failed to make the usual communications, whether oral or written, there might be something which the law could take hold of; but as the proofs stand the fact is otherwise.

The United States urge strenuously Planing Machine Company *vs.* Keith, 101 U. S., 479, 485. This case related to the obligations of a patentee as towards alleged infringers, and not towards the United States or the public at large. It moreover differed essentially from the case at bar, because here the United States seeks to establish a rule, heretofore unknown in the general administration of the law, by which a person who has acquired a legal title, is sought to be deprived of it on the ground of laches, while Planing Machine Company *vs.* Keith related strictly to a question of abandonment, not as a conclusion of law, but as a matter of fact. But in Smith *vs.* Goodyear Dental Vulcanite Company, 93 U. S., 486, where a similar claim of abandonment was set up, it appeared that the *caveat* was filed in May, 1852. The application for the patent was made in 1855, and was rejected three times, the third time being in 1856. Thus the matter laid until 1864, when a new petition was filed, and the patent was finally granted, June 7, 1864, more than twelve years after the *caveat* was filed, and nine years after the first application. The question was again purely one of intention, and the circumstances of the delay were met and overcome by the poverty and ill-health of the applicant. The court, observing on this case in Planing Machine Company *vs.* Keith, said, on page 488, that the patentee never relaxed his vigilance, he left nothing undone which he could do, and nobody had been encouraged by any action of his to appropriate his invention. His patent was sustained. It is to be borne in mind that, as the statute then stood with reference to each of these cases, the limitations now found in section 4894 of the Revised Statutes did not exist; so that the question stood on the common law. On the whole, in the cases of Smith *vs.* Goodyear Dental Vulcanite Company and Planing Machine Company *vs.* Keith, in each of which the question was one purely of intent, facts of the character raised by the contention of the United States which we are now considering, were clearly relevant, and easily and justly weighed and applied; but in the case at bar, where the proposition relates to the alleged legal duty of an inventor, the application of Planing Machine Company *vs.* Keith, and by consequent necessity of Smith *vs.* Goodyear Dental Vulcanite Company, would raise a crop of undefinable discriminations, according to the peculiar personal circumstances as to financial ability or inability, health or ill-health, of different inventors, not recognized by the law wherever a positive duty is imposed. Indeed, the whole tenor of the case of the United States, so far as it is supported by the proofs, has this same aspect, through the appearance of requiring of the defendant corporation a degree of diligence and astuteness apparently greater than that which would be expected from other inventors.

These, we think are the only general propositions made to us in illustration of the rule of diligence demanded, and we might properly dispose of the case on this general view of its substantial features; but its importance requires us to look at it somewhat closer, and to test it in detail at certain stages. The United States divide the history of this application into three periods: the first, from June 4, 1877, to June 9, 1882; the second, from June 9, 1882, to March 19, 1888, during which time the application awaited the trial and decision of the Drawbaugh case, first in the Circuit Court, and then in the Supreme Court; and the third, from March 19, 1888, to November 17, 1891, when the patent issued.

We find it more convenient to discuss the third period in advance of the second. The United States dispose of it very summarily, and the learned judge of the Circuit Court was of the opinion, as we understand him, that there was no effort, so far as he could see in the evidence, on the part of the respondent corporation, to prevent the delay covering this period. One proposition of the United States was as follows:

> With the decision of the Supreme Court in the Drawbaugh case the event happened which, by the understanding which had subsisted for six years between the Bell company, the Patent Office and Drawbaugh, was to determine the question of allowance of Berliner's application. The decision was as sweeping and comprehensive as could have been expected. The court held that Drawbaugh's story was, as a whole, a tissue of fraud and falsehood. The Bell company, assignee of Berliner's invention, and the People's Telephone Company, assignee of Drawbaugh's invention, were parties to the record. If it was possible for the court within the issues to decide the question of priority of invention between Berliner and Drawbaugh, it became *res adjudicata* by the decree. If it was possible for the opinion of the Supreme Court to have any persuasive force with the Commissioner of Patents, that persuasion was overwhelming. * * * * As to the third period, the time following the decision of the Supreme Court (excepting the interval between May 9, 1888, and February 26, 1889, during which time the application was standing upon a rejection by the examiner and appeal to the board), the Bell company knew that the only obstacle in the way of the issue of the patent was the pendency of Drawbaugh's applications; it knew that the bar of public use against those applications was insuperable, and hence that no interference could ever be declared; it knew that the highest court in the land had decided, in a suit to which both claimants, though their assignee's, were parties, that Drawbaugh's claim of prior invention was unfounded. Was there no way in which it could enforce that which it knew, and could so clearly show, to be its right?

We see no criticism touching the American Bell Telephone Company with reference to this period, except what is suggested in the interrogatory quoted. On the other hand, as we have already remarked, public officials receive the weight of the criticism, the United States have pressed on us the following views:

> No explanation can be given of these shameful proceedings in the Patent Office that will acquit the commissioner from an imputation of corruption, or an indifference to the rights of the public which would be scarcely less criminal, except that he did not realize what was going on. The application was not before him personally, and it is only charitable to suppose that its existence, the character and scope of its claims, their relation to the art of telephony, and the effect which the delay in the grant of the patent would have in prolonging the monopoly of that art, were never present before his mind together, so as to give him a realizing sense of the gravity of the situation. As for the examiners, that excuse cannot be offered, or any other, unless it be that they had become so much the slaves of routine that they had no conception of duty, except to keep the applications in their hands rolling down ruts which had been worn by custom, and had become oblivious of all considerations of justice and right which exist apart from precedents and rules.

It is also said that a mere suggestion on the record that delay in this application was prolonging the monopoly of the microphone, would have commanded instantly the co-operation of every member of the Patent Office corps in speeding its progress.

We may as well consider at this point, for the whole case, the propositions thus indirectly stated, that the commissioner was not personally advised of the true relations of this application, and that the American Bell Telephone Company was in fault for not bringing them personally to his attention. The record fully contradicts this. It shows beyond question that the Berliner and Edison applications, which went hand in hand, had become so notorious that the knowledge of them permeated the Patent Office from the head to the foot, and that the contest against them by Drawbaugh was so vigorous that it was impossible that any person, from commissioner to examiners, should not have understood their importance. The record shows by the testimony of four examiners, one assistant examiner, one commissioner and one assistant commissioner, and by the reports of an additional examiner and five additional commissioners, as well as by three separate decisions of the Board of Examiners-in Chief, acting either on the Berliner microphone or Drawbaugh's application, that all these officials and official bodies had personal knowledge of the existence and pith of the controversy, and of the parties to it, and more or less of the details. The testimony cited by the United States touching an alleged agreement to await pending litigation in the suits known as The Telephone Cases, 126 U. S., which will be referred to more at length hereafter, states positively that at the time this alleged arrangement was made, which was in 1882 or 1883, "the whole situation was understood by the commissioner personally." In February, 1889, the commissioner directly interferred in the proceedings, under such circumstances that he could not have failed to appreciate the issues in the case. Another examiner testifies that for certain reasons, which he explains, he constantly acquainted the then commissioner personally with all actions of importance which he contemplated, and solicited his views touching them. The commissioner was in office from the Spring of 1887 to the Spring of 1889.

At one point, as already stated, the case shows direct personal interference by the commissioner. A formal request from the examiner to the commissioner for a disposition of the Drawbaugh application, under date of January, 19, 1889, bears the following endorsement, under date of February 20, 1889, signed by the commissioner personally:

> This matter is postponed. If not called up by the commissioner on or before the expiration of six months, the examiner will bring the case to the attention of the commissioner.

The paper also bears a further endorsement, made exactly six months and one day subsequently, by the acting commissioner, as follows:

> This matter is again postponed until further notice.

Another endorsement appears under date of September 30, 1889, also signed by the commissioner:

> This matter is postponed to October 22, 1889, when, notice having been given, the order to show cause, dated January 19, 1889, will be heard by the commissioner.

That this series of postponements commenced by a personal order of the commissioner appears from the fact shown in the record that the commissioner informed the examiner that the Solicitor-General, who in this matter was acting as the Attorney-General of the United States, was conducting a suit against the Bell Telephone Company, being the same as United States *vs.* The American Bell Telephone Company, 128 U. S., 315, already referred to, and desired in the course of that suit to make use of Drawbaugh, or some of his witnesses, and that he, the Solicitor-General, thought it would be prejudicial to his chances of obtaining the testimony desired, if the Patent Office should at the same time prosecute a proceeding against Drawbaugh. This proof, of course, does not legally charge the Solicitor-General, as it is mere evidence of a conversation as to which he was not a party; but it leaves no doubt that at this point the commissioner took personal responsibility in this matter. The details touching the other postponements covered by the endorsements referred to we have no occasion to investigate.

It is plain, therefore, the commissioners were at various crucial points personally acquainted with the magnitude of the controversy, and with some of its details. Knowing its magnitude, they knew, at least in a general way, that detriment to the public interests would come from delay in the progress of the case, in the event that it was followed by the issue of the patent. This was all which it was necessary they should know, as it is the pith of the entire complaint of the United States. Having this knowledge, the claim of the United States that the American Bell Telephone Company should have suggested on the record, or anywhere else, that delay in the application was prolonging the monopoly of the microphone, falls, of course, to the ground, unless we accept the extreme proposition that it was the duty of that corporation to keep this fact constantly before the eyes of the commissioner personally.

It is not to be forgotten that among the difficulties which the Bell Telephone Company was forced to face, was the fact that its application was twice rejected, once during the first period named by the United States, and the second, under formidable objections, during the third period. A brief statement of the occurrences during the latter period was specially reported by the examiner to the commissioner under date of October 29, 1891. This report contained the following statement:

> The interfering application, by reason of which this application has been suspended and withheld from issue, contained claims for the same invention as that herein claimed; it was therefore necessary to declare an interference if the interfering applicant could show that he was entitled to the claims except as regards the question of priority with Berliner. But the claims of the interfering applicant were under rejection for various reasons, and

it was necessary that he be given opportunity to overcome the rejection. To this end he prosecuted his application. Finally my immediate predecessor instituted a public use proceeding under the supervision of the examiner of interferences. This proceeding was sharply contested by the interfering applicant, and resulted against him, my decision based on the findings of the examiner of interferences having been affirmed by the board of examiners-in-chief, and the decision of the board having been yesterday affirmed by you. This decision removes the only impediment to the allowance of the Berliner application.

The Berliner patent was taken out almost immediately afterwards, that is, November 17, 1891.

Subsequently, on December 13, 1892, at the request of the Attorney-General touching the pending suit, the Secretary of the Interior obtained a report from the Commissioner of Patents of the history of the patent. Both the commissioner and the Secretary of the Interior had before them a brief from the relator at whose suggestion this suit was brought; so that the issues were fully understood by them. The commissioner's report to the Secretary of the Interior contains an extract from the report of the examiner to which we have already referred, as follows:

The office delay from October 23, 1883, to November 16, 1888, should not, so far as the records are known to me, have occurred.

This examiner was not personally familiar with the unofficial and informal proceedings covering that period. But the report of the commissioner was such that the Secretary of the Interior answered the Attorney-General that it was "certainly true that from 1889 the case has been pressed to judgment without any delay that could be avoided." This means undoubtedly, in accordance with the dates given by the examiner, to include the whole of the year 1889, at least so much of it as the officials whose reports we are discussing were in office, which was from the early part of March. While the report of the Secretary of the Interior cannot be taken formally as governing this court, yet in view of the facts to which we have referred, and of others in the record, we unhesitatingly accept it as our own conclusion. It covers substantially the third period.

The disposes of all questions of diligence so far as this period is concerned, whatever may be the rule. But for the purpose of further illustrating in what manner the American Bell Telephone Company could practically exhibit the degree of diligence required of it by the United States, we inquired what obligation rested on it with reference to the interference to the Solicitor-General? He presumably represented the settled policy of the Department of Justice. In the line of criticism in this case, this supposed interference of the Solicitor-General has also been severely reprehended; but he is not on trial here, and has not been heard. We are to assume that he was engaged in the honest performance of what was regarded by him as a great public duty, in a legal contest of the gravest character with the American Bell Telephone Company itself, represented here as a wealthy, powerful and influential antagonist. In reply to a question put from the bench, in what effective way this corporation could exercise with reference to this particular crisis the degree of diligence required of it by the United States, the answer was, by laying the case in all its relations personally before the Solicitor-General. The United States seem to assume that the Solicitor-General, as well as the commissioner, failed to appreciate the grave consequences, as now described, likely to arise from delay in acting on the application touching the Berliner microphone, and that it was the special duty of the defendant corporation to set him right. But however this may have been, and looking at the matter from the position of those accustomed to engage in large and important litigation, we cannot doubt that the counsel for the United States would be forced on reconsideration to agree with the court that, at the crisis to which we refer, any approaches by the American Bell Telephone Company to the Solicitor-General, having regard to anything which would weaken or hamper the prosecution of the then suit, would have been regarded with suspicion, and would have been entirely beyond and outside of the efforts reasonably expected from solicitors and counsel with reference to any pending hostile proceedings. Like every other proposition in the case having in view an explanation of the practical methods in which the American Bell Telephone Company could have exercised at various stages the extreme degree of diligence asked of it by the United States, this one fails to bear out any test whatsoever.

But the United States say that during this period to which we are now referring, the commissioner made a ruling which, if availed of by the American Bell Telephone Company, would have promptly solved the pending difficulties. We refer to it, not for the purpose of going over the conclusions we have already stated on this part of the case, but as a further illustration of the ineffectual attempt of the United States to suggest practical methods available to that corporation. The United States point out that in May, 1888, the commissioner ruled that, notwithstanding the pendency of a probable interference, or of an interference actually declared, the commissioner might, under the circumstances described in that decision, direct the issue of one of the patents involved. This was so clearly contrary to the long settled practice of the Patent Office, and would so directly tend to involve the office in the embarrassing necessity, from time to time, of issuing two patents for the same invention to hostile applicants, that we find no mention of it further in the case, and no suggestion that any of the officials of the Patent Office ever afterward attempted to act on it. However, the American Bell Telephone Company in 1886, soon after the decision of The Telephone Cases at the circuit, attempted to accomplish this same result, on the ground that that decision disposed of the Drawbaugh application. The matter came to the personal attention of the commissioner, who, in his reply of April 24, 1886, practically declined to acquiesce in this proposition, and suggested that an interference should be declared, reserving himself from prejudice touching such declaration if it came before him on appeal. But under the settled practice of the Patent Office, and the construction which that office had long given Section 4904 of the Revised Statutes touching interferences, the declaration of an interference at that time clearly could not have been made. The commissioner was then new in his office, and as his suggestion was not an order, it was not followed out. The American Bell Telephone Company having attempted this once, and failed, may well be excused for not attempting it again.

Returning now to the second period named by the United States, that is to say, from June 9, 1882, until the decision of the Supreme Court in the Spring of 1888 in The Telephone Cases, reported in 126 U. S., we will note at the outset that the report of the commissioner, accepted by the Attorney-General, to which we have already referred, reduces this period to one from October 23, 1883, to November 16, 1888, a matter of some five years. This, however, is a matter of no consequence, except so far as it is explanatory of some other facts to which we may refer. June 9, 1882, the Drawbaugh application was still pending in the Patent Office. It had been rejected on the ground that the Edison carbon microphone and the Bell telephone had been in use more than two years prior to Drawbaugh's application; but Drawbaugh claimed that this public use was without his consent, and therefore did not affect him. It is also conceded by the United States, as well as claimed by the American Bell Telephone Company, that this rejection of Drawbaugh was not final, because, as said by the United States, "it was still open to him to traverse the fact, and have the question settled by public use proceeding." But it is said by the United States that the Patent Office could easily have disposed of Drawbaugh, because at that time the law was well settled, that under the statute of 1870, two years' public use, even without his consent, was fatal to him; and Manning *vs.* The Cape Ann Isinglass and Glue Company, 108 U. S., 462, is referred to as settling this point. This case was not decided until May 7, 1883. It did not involve this question; and what was said therein touching it was a *dictum*, and was never acquiesced in by Drawbaugh's solicitors. Whether the law can now be regarded as settled, in view of Andrews *vs.* Hovey, U. S. 267, decided November 14, 1887, in consideration that it discusses the act of 1870, now Section 4886 of the Revised Statutes, as well as the act of 1839, we need not consider. The American Bell Telephone Company was compelled, with reference to the progress of this application, to meet the practical condition of things, and we must put ourselves in that position. Therefore, whatever may now be said as to the theoretical side of the law, it is more appropriate to the purposes of this case to observe that Drawbaugh's solicitors did succeed in practically retaining his application under adjudication by the Patent Office until near the close of October, 1891, as already stated.

But Drawbaugh made another difficulty of, perhaps, a more serious character. The vigor and pertinacity with which the Drawbaugh application was maintained in hostility to the Bell interest, went to such an extent that we may well infer from the record that, even if the position of the United States, substantially to the effect that the American Bell Telephone Company is to be judged of in its performance of a legal duty according to its pecuniary ability, was sound, it would be offset and neutralized by the financial resources, skill and personal importance of whomsoever controlled the Drawbaugh interests. Not only was Drawbaugh pressing his own application, but it is admitted by the United States that he was opposing the issue of a patent on the Berliner microphone, on the ground of prior invention by himself, and was ready to file affidavits in support of his contention. What these affidavits would mean will appear from the fact that the Drawbaugh case, in all its aspects, as opposed either to Bell, Edison or Berliner, was a unit, and in either aspect involved the great bulk of the facts considered in The Telephone Cases, 126 U.S., occupying that entire volume, and finally dividing that court by three judges in favor of Drawbaugh to only four against him. It was claimed by the United States at one point that this litigation did not involve the microphone, but, with a clear inconsistency, the United States at another point in its argument at bar rested one of its propositions as to the alleged duty of the commissioner at a certain crisis, on the distinct ground that the Circuit Court had decided that Drawbaugh did not invent the microphone. The fact is that the entire dispute as between Drawbaugh on one side and Bell, Edison and Berliner on the other, turned on one and the same question, namely, the truth or falsity of Drawbaugh's story; so that, as testified to by the president of the American Bell Telephone Company, if Drawbaugh's story was substantially true, it cut up by the roots all that Edison and Berliner had done. Therefore the affidavits which the United States say Drawbaugh was ready to file, first on his side and then in response, might be equivalent to the substance of the case found in 126 U. S. At one point in the argument the United States stated that the condition in June, 1882, was as follows:

The examiner was refusing to issue Berliner's patent because Drawbaugh had an application pending for the same invention; he was refusing to approve Drawbaugh's claims because they were barred by public use; he could not declare an interference until that rejection was overcome, and he knew that it could not be overcome. Here was a deadlock!

In partial explanation of this apparent deadlock, it is to be said that the practical construction of Section 4904 of the Revised Statutes touching interferences, as given it by the Patent Office, is to the effect that no interference can be declared involving the claims embraced in any application, until those claims have been found to be patentable independently of the possible result of the interference. Therefore, the practice has been, on discovering claims apparently interfering, to hold back both applications until the patentability of each is determined, and then declare an interference. This produces very much the same result, so far as delay is concerned, as would follow if, with an ordinary bill of interpleader, no parties could be made to it, until after the right of each person sought to be made a party had been determined as against all the world except the other intended parties. By the admission of all the course of proceedings had crystalized into that form, and the American Bell Telephone Company is not subject to just criticism if it accepted it as it found it.

In response to the solicitor of the American Bell Telephone Company, the examiner wrote him on June 9, 1882:

As at present advised, it is believed that the claims presented may be allowed; but final action in this case must be suspended in view of probable interferences with other pending applications, which will be declared as soon as possible.

It is admitted that the "other pending applications" included Drawbaugh. Nothing further was heard in this direction until October 8, 1883, when the solicitor having in charge the Berliner application wrote the commissioner, referring to this letter of June 9, 1882:

Since then I have been awaiting the official action. I beg to call attention to the case, and ask that it may receive action.

The United States urge strenuously that the official record shows inaction between the dates of June 9, 1882, and October 8, 1883. The proofs of the informal proceedings show otherwise; but this is rendered of no consequence by the reply of the Patent Office, which came promptly within a few days, as follows:

In response to applicant's letter, filed October 9, 1883, it is stated that further action in this case, on the part of the Office, must be still further postponed, until the conditions of interfering applicants will permit the declaration of interference, which seems unavoidable.

This renders unnecessary any consideration of the intervening period last referred to, because all the rules of equity require that it should, under the circumstances, be accepted as the adjudication by the United States, through the only officials to whom the respondent corporation could apply, that efforts during that period on the part of that corporation would have been unavailing. But the substantial complaint of the United States comes down to the proposition that during this period the application was suspended, and the patent held from issue, for "a single continuous, and wholly insufficient reason." This reason is stated to be the awaiting of the decision of the Drawbaugh suit, embraced in The Telephone Cases, 126 U. S., by virtue of an alleged agreement, to which it is said the Commissioner of Patents, the Bell company and Drawbaugh were all parties. The United States claim that this arrangement, whatever it was, was in terms an agreement and an unlawful one. There was no allegation in the bill to this effect, nor do the proofs support it. There was, undoubtedly a common understanding and a common consent. It is testified positively that the commissioner shared this common understanding, and that he personally understood the whole situation. We have already alluded to the testimony of the president of the respondent corporation to the effect that if Drawbaugh's story was substantially true, it cut up by the roots all that Edison and Berliner had done. He also added that the quickest thing to do was to try the case in the court where it was, and that by common consent the Berliner application waited till the determination of that suit. The examiner at one time in charge of these conflicting applications, also testified that he felt and believed it was felt and understood by all parties, that it would be a much quicker and more satisfactory way of determining the whole question to await the decision of the courts. He also testified that it was the tacit understanding between the Office, and, as he understood, the parties in interest, that the proceedings then being had in the courts would be the best solution of the difficulty.

When this agreement, arrangement or understanding, whatever it was, was first entered into, has not been pointed out to us; but the correspondence, to which we have already referred, between the Office and the solicitor of the defendant corporation, running to October, 1883, indicates that it had not taken form at that date, or that if it had taken form, it was understood that it was purely of an indefinite character, especially with reference to the time for which it was to run. It may also be questioned whether, when it first took form, it extended beyond awaiting the decision at the circuit. However, this may have been, there is nothing in the case to show that the parties undertook to enter into an agreement. The evidence, and the reason and probabilities of the thing, satify us that whatever common consent there was to abide the result of the litigation, was the consequence of the independent judgment, formed fairly and honestly—at least by the officials of the Patent Office and by the representatives of the American Bell Telephone Company—that on the whole this was the best thing to do; and the common consent consisted only in the interchange of these views.

Now can it said that, under the circumstances, this common judgment and the so-called common consent arising from it, were not wise? Before we can condemn we must put ourselves in the position of the parties at the time, with all the surrounding difficulties, and assume to understand them better than the gentlemen concerned on either side, with the extensive practical experience which all of them possessed. But assuming that it was not wise, that, under the circumstances, the commissioner made an error of judgment, that it was his duty to have proceeded regardless of the pending litigation, and that also the American Bell Telephone Company committed an error in sharing his judgment, is this court to impose on this corporation the penalty of losing its valuable patent on that account, and give the United States, whose officers also shared in the same error, the entire benefit of the penalty? On every principle such a conclusion would be an outrage on justice, and in violation of the fundamental rules by which the law refrains from imposing punishments on parties who honestly exercise their judgments under the existing circumstances, especially circumstances of difficulty. The United States claim also that the position was changed when the decision was made at the circuit in the litigation referred to in December, 1885. In speaking of this litigation while in the Circuit Court, we will for convenience, though somewhat inaccurately describe it as The Telephone Cases. In direct inconsistency with their proposition, made in another connection, that the microphone was not in issue in this litigation, the United States in this connection insist, as a substantial and important proposition, that it was at this time decided that Drawbaugh never invented the microphone at all. Assuming this all to be true, and that the decision on appeal to the Supreme Court should not have been awaited, yet there can be no criticism against the American Bell Telephone Company on this score. The examiner testifies that soon after the decision of the Circuit Court, its solicitor urged the passage to a patent of both the Berliner and Edison applications. The result of this was that the examiner, who testifies that he acted on his best consideration, made personally the communication to the commissioner, of April 23, 1886, to which we have already referred, asking his direction touching this request. His reply was given on February 24, 1886, to which we have also already referred, not granting the request and suggesting the declaration of an interference. This, under the law as understood at the Patent Office, was impracticable, as we have already explained. The American Bell Telephone Company had done all that reasonable usage required of it, and after this the case drifted along

Continued on page 334.

CONTRIBUTORY INFRINGEMENT OF PATENTS.

PART OF PAPER READ BEFORE THE AMERICAN ASSOCIATION OF INVENTORS AND MANUFACTURERS, BY HUBERT HOWSON, OF NEW YORK.

The two ways of contributing to an infringement illustrated in the several examples I have so far given, namely, either intentionally supplying a material part of a patented combination or willfully supplying the means for carrying out a patented process, are those which are most likely to arise under the extended sub-division of our manufactures, but if we call to mind again the principle of law, upon which this doctrine of contributory infringement is based, it will not be difficult to perceive that there may be several other ways in which one can contribute to an infringement of a patent right.

In the same year in which Judge Woodruff decided the case of Wallace *vs.* Holmes, he decided a case in which it appeared that the defendants had the right to use one patented stone machine in a certain quarry, but nowhere else. They, however, permitted the Rutland Marble Company to take that machine and use it in another quarry. They thus consented, or were parties, to a use of the machine beyond their rights or license, and aided and co-operated with the Rutland Marble Company in a wrongful infringement of the plaintiff's patent, and for that infringement the defendants were held liable.

Another interesting case of contributory infringement was decided by Judge Blatchford in 1 79. It consisted in the transportation by the Old Dominion Steamship Company of cotton ties from New York to various southern ports, knowing that such ties were intended for sale and use in southern cotton ports and elsewhere. The Court said:

It is entirely clear that the owners of infringing and unlicensed cotton ties, who are causing them to be transported by the vessels of the Old Dominion Steamship Company, are sending them for sale and use, and are employing said company and its officers as agents and servants in promoting and effecting such sale and use. It would seem, on principle, that there ought to be no difficulty in restraining by injunction all persons, whether officers of a company or not, who are aiding in the promotion of the infringing sale and use, whether such persons would be liable for profits or damages or not.

When the term "contribution" is used, in ordinary conversation, it suggests the "passing around of the hat," and in point of fact, that is one way in which you may contribute towards an infringement. In a case of Bate *vs.* Gillett, the Court had granted an injunction against the Gilletts, enjoining them from infringing the plaintiff's patent.

In obedience to the injunction, they immediately ceased to make use of the complainant's process for preserving meat during transportation and storage, and returned to the old method; but, in the Fall of 1882, they entered into an agreement with other shippers and exporters of meat to contribute to a fund, at a certain fixed rate, for the purpose of making a common defense against all suits which should be thereafter instituted by the complainant against any one of the parties to the said agreement, for the infringement of the patent.

Suit was brought against one of the parties and the expense of defending that suit was, or was to be, paid out of the common fund, and it was shown that these defendants had paid their proportional share of money to the fund.

Such conduct is in disobedience of the injunction in its spirit, if not in the letter. They are doing, indirectly, what they have been commanded not to do, either by themselves or through the agency of others. * * * * * * * It is impossible, in view of the evidence, to see wherein their acts differ, in principle, from direct and personal infringement. The practical effect of such acts is the same in either case. Where it is proved that what a party does is done for the purpose and with the intent of aiding infringement, he is liable under the doctrine of contributory infringement.

Finally, contributory infringement may take on more of the nature of a willful conspiracy than is suggested in the cases to which reference has been made. In the comparatively recent case of Waterman *vs.* Shipman, decided by the Circuit Court of Appeals in New York, the bill of complaint alleged a combination between the defendants to deprive the plaintiff of the benefits and advantages of his license.

Waterman had the exclusive license to manufacture under the patent in suit. One of the defendants, Asa L. Shipman, afterwards acquired the legal title to the patent and undertook to give his sons, the co-defendants, a license. The Court said:

But there is no reason or authority for the proposition that a licensee, who has the exclusive right to manufacture and sell a patented article, cannot maintain a suit in equity against the owner of the patent, if the latter is guilty of infringement * * * * *. If the licensee's rights have been infringed by the owner, and third parties confederating with the owner, there is no reason why all the infringers should not be joined as defendants.

"The evidence shows that the license granted by Asa L. Shipman to his sons, the other defendants, was granted by him, and procured by them, for the paramount purpose of preventing the complainant from enjoying the monopoly conferred by his license. The defendants, therefore, are joint infringers."

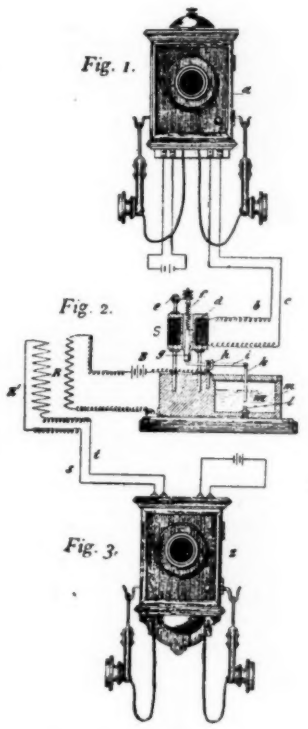
Many other reported cases might be cited to elucidate the subject, but the limits of this paper will not permit. For the benefit of those who may be interested to look into the question, I will add a list of cases bearing on it, and some cases on the more or less allied topic of Repair and Reconstruction.

What has been said, however, will serve to make it clear to you that you may infringe a patent, not only by directly making or selling or using the patented invention yourself without license, but also by intentionally aiding any one else in any such unlawful act.

A Novel Sound-Amplifying Telephone System.

A gentleman, bearing the euphonious name of Wasili Alexandrowicz Nikolajczuk, has recently patented a method which aims to accomplish the amplification of sound vibrations. It is true, that many foreign as well as domestic inventors have tried to materialize this "telephonic dream" and have utterly failed; a fact which by no means seems to have dampened their ardent spirits.

Again, a great many experimentors have sought to solve the problem by employing telephonic relays, and while there is no doubt that the loudness of the transmitted sounds can thus be increased, the advantage



A NOVEL SOUND-AMPLIFYING TELEPHONE SYSTEM.

is but an apparent one, because, as is well known, whatever is gained in loudness is lost in distinctness of articulation.

M. Nikolajczuk seems to have been aware of some of the difficulties inherent in this problem. He has struck out into a new path, and experience must prove whether or not there is a real advantage in the use of his method.

The inventor desires distinctly to construct an instrument for the transmission of sounds over long distances. He causes the transmitter currents to vary the internal resistance of a separate source of electricity, which in turn transforms the current variations into telephonic vibrations. An examination of the accompanying illustration fully explains his idea.

Figs. 1 and 3 are transmitters at two distant stations. The line is interrupted by a device, shown in Fig. 2. Transmitter *a*, Fig. 1, is connected through *b*, *c* with solenoid or coil *s* surrounded by an iron envelope to increase its sensitiveness.

The coil carries a standard *e*, which holds a projecting arm. Adjustably attached to this arm is a spring *f*, supporting a light cylindrical magnet *g*, which bears at its lower extremity a lever *i* pivoted at point *h*. The short arm of the lever *k* carries a platinum electrode immersed in a vessel *m'* filled with acidulated water *m*.

Opposite this electrode there is a second stationary one, *l*, screwed to the bottom of the containing vessel. One pole of the battery B is connected to lever *i* and electrode *k*, while the opposite pole of the battery is joined to *l*. The primary of an induction coil R, included in this circuit, is connected through its secondary R' to receiver *z* at the distant station.

The device operates as follows: The talking currents produced in transmitter *a* pass along *b*, *c* and energize the coil of solenoid *s*. In turn, these current impulses act upon the suspended magnet *g*, which commences to vibrate, and these vibrations affecting lever *k* cause the moveable electrode either to approach closer or to recede farther from the stationary electrode.

These variations in the distance separating the electrodes produce a considerable variation in the resistance of battery B and corresponding changes in the primary and secondary circuits R and R', respectively, which are transformed by receiver *z* into telephonic sounds.

While it is evident that the transmitter at *a* will act in the above described manner on solenoid *s*, it is by no means clear how the transmitter at the distant station can reciprocate upon the receiver, shown in Fig. 1. But any system of sound amplification that acts only one way is of no commercial or practical value. M. Nikolajczuk's intermediate apparatus is evidently A. G. Bell's original liquid transmitter adapted to operate as a telephonic relay.

MOONLIGHT SCHEDULE FOR THE UNITED STATES.

[*Issued by the National Carbon Company.*]

JULY, 1895.

Day of Mo.	Light.	Day of Mo.	Extinguish.	No. of Hours.
	H.M.		H.M.	H.M.
1	P. M. 11.20	2	A. M. 3.30	4.10
2	" 11.50	..	.....	3.40
3	....	3	A. M. 3.30	
4	A. M. 12.30	4	" 3.30	3.00
5	" 1.30	5	" 3.30	2.00
6	No light.	6	No light.	
7	No light.	7	No light.	
8	No light.	8	No light.	
9	P. M. 8.00	9	P. M. 10.30	2.30
10	" 8.00	10	" 10.50	2.50
11	" 8.00	11	" 11.10	3.10
12	" 8.00	12	" 11.30	3.30
13	" 8.00	13	" 11.50	3.50
14	" 8.00	15	A. M. 12.10	4.10
15	" 8.00	16	" 1.00	5.00
16	" 8.00	17	" 1.00	5.00
17	" 8.00	18	" 1.40	5.40
18	" 8.00	19	" 2.30	6.30
19	" 8.00	20	" 3.30	7.30
20	" 8.00	21	" 4.00	8.00
21	" 8.00	22	" 4.00	8.00
22	" 7.50	23	" 4.00	8.10
23	" 7.50	24	" 4.00	8.10
24	" 7.50	25	" 4.00	8.10
25	" 8.30	26	" 4.00	7.30
26	" 9.00	27	" 4.00	7.00
27	" 9.30	28	" 4.00	6.40
28	" 9.50	29	" 4.00	6.10
29	" 10.20	30	" 4.00	5.40
30	" 11.00	31	" 4.00	5.00
31	" 11.00	Aug. 1	" 4.00	5.00
	Total			146.00

The Value of Being Quoted.

To be constantly quoted is certainly a sure sign of successful newspaper work. It means that the best judge of a newspaper, the exchange editor, is passing his favorable opinion.—*The Fourth Estate.*

OPINION IN THE BERLINER CASE.

(*Continued from page 332.*)

until the decision of the Supreme Court was announced in March, 1888, and the third period commenced, which we have already disposed of.

The events which we have recited give us another opportunity of showing the inability of the United States to furnish a practical rule by which to test the high degree of diligence which they require. On being asked what course was practicable at this period to answer their demands in this direction, they seem uncertain what method should have been adopted. The United States at one point say that the commissioner could have read the evidence in the infringement case, meaning The Telephone Cases, for himself, and decided the question of priority on the facts there shown. Of course, a request of the commissioner to do this, or cause it to be done by any one in the Office, would have been fruitless. The principal suggestion of the United States on this score was worked out at great length and apparently with much labor, but it need be only briefly stated by us. It commences by explaining a practice of the Patent Office, which came into force February 6, 1883, by which, on an issue of public use, hostile affidavits cannot be filed except subject to cross-examination by the applicant. It then suggests that, on the strength of the applicability of this practice, an issue of prior invention might have been made. It is said this would not have been strictly an adversary proceeding, as it would have been solely for the information of the commissioner; that therefore it would have been under his control, and that, instead of permitting the examination of the mass of witnesses who testified in The Telephone Cases, the commissioner might have said to Drawbaugh: "Produce a dozen of those who know most about your invention, examine them in the presence of Berliner, and let him cross examine them?" or, the United States say, the commissioner might have fixed a limit of time, instead of the number of witnesses, and then there would have been no excuse even for consuming more than 60 days in the investigation.

But for this proposed method of proceeding the United States show no hewn path. There is no suggestion in the record that any such proceeding ever took place in the Patent Office. It is, like their other suggestions, theoretical.

The practical summing up of all these various suggestions is that the American Bell Telephone Company is in effect censured for not reforming both the practice and the officials of the Patent Office. We think this demand is without parallel or precedent, that the case may justly be stated in this form, and that, when thus put, it shows itself so revolutionary as to require the legal mind to reject it on the mere statement.

The case has been strenuously pressed on the court as one to which should be applied the legal maxim, *sic utere tuo ut alienum non laedas*. But the attempt to apply this merely brings us back to the investigation of the same legal propositions. The United States seem to assume, as is frequently done, that this is a maxim of universal benevolence, and that the word *laedas*, and the word injure into which it is commonly translated, are each to be used in the general sense and not in that of the law. This is entirely a mistake. The words are used in this connection in their primary and technical sense. Literally translated the matter relates only to injuries committed to property; but Broom's Legal Maxims, in the note to page 327, gives as its true substantive meaning,—"so use your own property as not to injure the rights of another;" and in the text he states the general rule to the same effect. He sums up his discussion touching this maxim by laying down the principle, that one must use and enjoy his own property so as "not to affect injuriously the right of his fellow subjects." He also says in the same summing up, that where rights conflict, we must consider whether their exercise is not restrained by the existence of some duty; "and," he continues, "whether such duty be or be not imposed, must be determined by reference to abstract rules and principles of law." So it is plain that no attempt to apply this maxim would relieve us from the necessity of doing what we have already done, that is to say, from ascertaining from sources outside of the maxim what obligations the law imposed on the American Bell Telephone Company under the circumstances of this case.

We have thus shown, by testing at various points, that the United States give no practical rule for measuring in this case the obligation demanded by them, that is to say, "an extraordinary duty which could be discharged only by the greatest possible diligence in the prosecution of the application." Moreover, if there was any such rule in law, the United States have failed to meet the burden resting on them, of proving that the lack of compliance with it in this case had any practical result in producing the delays complained of. It would, indeed, be quite plausible to declare that the American Bell Telephone Company, with all its resources, could have found some way to break the deadlock if it had earnestly desired so to do. This is, in fact, what the United States say. Perhaps this is true. But the courts have never yet been vested with authority to deprive any person or corporation of property or rights on the strength of any such mere assertion, nor without allegations and proofs in a definite and practical form. The lack of these, under the circumstances we have explained, aids the proposition that there is no such obligation as claimed by the United States. There is no precedent brought forward by the United States to support their position, nor has this court found any, either in this department of the law or in any other. Nor does the proposition of the United States rest on any principle which can be supported by authority from any quarter, or by any method of reasoning which connects it with any fundamental legal doctrine. By granting a patent for a meritorious invention the United States parts with nothing which it before had, but only recognizes and supports for a limited period the equitable title of the patentee. We think this is the first instance in which either the people or the king, wherever the common law prevails, has sought to revoke by legal proceedings, on the ground of imputed or merely legal fraud, a grant of this character, issued to a subject after full official knowledge of all the facts, where there has been no deceit, collusion or corruption, and where the subject duly complied with all statutory and departmental requirements, merely because the officers in charge have been dilatory and the subject failed to use zeal in spurring them on. The law goes quite far enough in protecting the state against the acts and omissions of its agents, without our pushing it to the extreme of adopting this heretofore unheard of proposition. We do not, however, intend to have it inferred that we have determined that the law requires any degree of diligence beyond a compliance with statutory provisions, official regulations and the formal demands from time to time of the public officials charged with duties under the patent law. We do not determine that any degree of laches whatever will forfeit a patent once granted, reserving, of course, cases of abandonment, and other cases where, through laches, the equities of strangers have become established, neither of which classes are involved in the suit at bar. Congress, in Sections 4894 and 4904 of the Revised Statutes, established certain fixed periods for giving progress to applications for patents, which the Supreme Court has so far recognized by analogy as to apply the limitation to a bill in equity filed under Section 4915 of the Revised Statues. Gandy *vs.* Marble, 122 U. S., 432. The United States ask us to establish a period of limitations other than fixed by statute, and we do not decide that, under any circumstances, we have any authority so to do. We merely determine that the case of extreme diligence, as made by the United States, cannot be maintained.

While the delay in this case was unusual, it was not unprecedented. We have referred to Smith *vs.* The Goodyear Dental Vulcanite Company, 93 U. S., 486, where the patent was granted nearly nine years after the application was filed, and nearly 12 years after the caveat was deposited in the Patent Office. The appellants have shown from the record that during the two years of 1893 and 1894 49 patents issued, with an average of 10 years after the applications were filed, 10 of them 10 years or over, and several of them 14 years or over; and they well observe that the number of these long-pending cases is enough to show that something in the Patent Office system produces them. Although the case shows that the applications of commissioners to Congress have been fruitless for relief, yet, so far as we can discover, the executive departments must still turn for that purpose in that direction, and not to the courts.

The second ground of complaint of the United States is stated in the following language:

> On September 3, 1880, Berliner filed an application which professed to be a division of his application of June 4, 1877, on which division a patent was granted November 2, 1880, numbered 233,969, which patent was assigned to the Bell company on April 1, 1881. It is alleged in the bill that this patent covers the invention described and claimed in the patent in suit No. 463,569, and that it exhausted the authority of the commissioner in respect to that invention, and that the commissioner was therefore without jurisdiction to issue the subsequent patent.

At the bar the United States rested on this point on Miller *vs.* The Eagle Manufacturing Company, 151 U.S., 186, already referred to. The principle of this decision is evident, and was stated as early as 1865, in The Suffolk County *vs.* Hayden, 3 Wall, 315; and it appears from the record that it was recognized by the Patent Office before Miller *vs.* Eagle Manufacturing Company was decided. We may remark that the facts in the case at bar on their face are not like those of Miller *vs.* Eagle Manufacturing Company, as here the two patents claimed to interfere were not issued to the same applicant, and the acquirement, after it issued, by the American Bell Telephone Company of the Berliner patent of November 2, 1880, would not necessarily estop the assignee. Nevertheless, as this point is not made in the answer, it may be that the case raises an estoppel, of which the parties were aware, not brought to the attention of the court. Therefore we are compelled to investigate this question independently of this suggestion.

This statement of the issue renders it unnecessary to refer to the pleadings, except to so much of the answer of the American Bell Telephone Company as alleges that the question now raised by the United States was, in the progress of the application for the patent for the Berliner microphone, made the subject of special consideration by the examiner and the Board of Examiners in-Chief. The examiner, on this point, decided against the American Bell Telephone Company as assignee of Berliner, but the board reversed the examiner; so that, in consequence thereof, the patent now in dispute was duly and formally issued. The examiner and the board had before them all the facts bearing on this branch of the case which we now have, and understood the law as stated anew in Miller *vs.* The Eagle Manufacturing Company; so that the patent was issued under no mistake of either law or fact. The most that can be claimed by the United States is that the officials of the Patent Office, having all the law and facts before them, erred in the exercise of their free judgment in the determination that the earlier patent did cover the invention described and claimed in the later one. Even were this so, the result was not a mistake in the sense of the law in its application to the principles of cancellation of deeds and other instruments; but it was merely an erroneous judgment and determination of the ultimate fact deduced from the primary facts, all of which were known.

As we are clear that this proposition of the United States cannot be sustained on the law, even admitting the facts to be as claimed, we will not undertake to determine the question of the substantial identity of the respective claims of the two patents, or any of them. We prefer to leave that without prejudice, in the event it hereafter involves other individual or corporate rights.

As we have already said United States *vs.* American Bell Telephone Company, 128, U. S., 315, came before the court as a pure case of intentional positive fraud, and the court there was careful to say, on pages 355 and 356, as follows:

> It may be possible that a patent would not be absolutely void where the patentee was not really the first inventor, and the act of Congress made provision that any man sued for an infringement of such patent might prove that the patentee was not the original discoverer or inventor. But we do not decide here whether a patent is absolutely void because the patentee is not the first inventor, nor whether a court of equity should set aside a patent where the party had obtained it without fraud or deceit, believing himself to be the first inventor. It is sufficient for the present case, in which, on demurrer, we wish to decide nothing more than is necessary to determine whether the defendants should be called to answer the bill, to say that the charge here is that he knew he was not the first inventor, and that his efforts to procure the patents were fraudulent because he was aware that he was obtaining a patent to which he was not in law or equity entitled.

Therefore, it must be said that United States *vs.* American Bell Telephone Company does not in terms reach the case at bar. Nevertheless, the principles underlying the assumption of jurisdiction in that case, coupled with other decisions of the Supreme Court, especially those touching bills in equity to set aside patents under the land laws of the United States (United States *vs.* San Jacinto Tin Company, 125 U. S., 237, 285), seem to support jurisdiction on the same basis which supports the ordinary bill in equity brought to cancel an instrument obtained through fraud, accident or mistake, and to give the United States the same broad relief which would be given to an individual. In reference to this proposition we agree with the United States that a bill of this nature would lie in a case of mistake, as that word is properly understood in the branch of the law touching this topic, except so far as the peculiar provisions of the patent statutes may limit the general rule. We are also clear that a bill of this nature would lie where there was a clear exercise of excess of power, still using these terms in the proper sense as relating to this branch of jurisdiction.

It is hardly claimed that the circumstances of the case at bar show mistake in the proper sense of the word in this connection; and the facts to which we have referred, make clear that such a proposition could not be maintained if made. Ordinarily the mistake which the equity courts relieve, is something substantially different from mere error of judgment, based on full knowledge of the facts and law; and, although there may be exceptional cases arising from extreme circumstances, it could not be claimed that this is one of them. The main question, therefore, is whether the issuing of the second patent to the same applicant for the same invention, under such circumstances that it was not clearly manifest that the inventions were the same, and that there might be a reasonable difference of opinion on the point of identity, involved in the view of the statutes touching patents such an excess of power as would justify a court in equity in rescinding the second patent thus issued. We cannot put the case more strongly than this in favor of the United States, because at the best it must be admitted by the United States that there is a reasonable doubt on the point of identity.

It will be seen that this question opens a broad field; because if this court can be called on in equity, on the suggestion of the United States, to rescind a patent merely on this ground, it may in the same way be required to investigate every question which lies behind the issue of a patent, including those of novelty, usefulness, public use and anticipation. The distinction which the United States seek to make between the case at bar and cases which might involve the other issues, as of novelty, usefulness, public use and anticipation, are clearly not well founded. Some extreme supposed examples which the counsel put, do not help in sustaining these distinctions, but only illustrate the fact, which must be freely admitted, that, with reference to any of these various topics, there may be such exceptional cases as to show a clear error within the meaning of this branch of the law, thus involving an excess of power. Such examples, for instance, as that of the commissioner issuing two patents to the same applicant in identically the same terms, are easily disposed of without involving any general principles.

We are satisfied that the statutory provisions touching the Patent Office are *sui generis*, and contain in themselves peculiarities, which render inapplicable certain rules and decisions otherwise of an analogous character. This fact is well noted in Orchard *vs.* Alexander, 157 U. S., 372, 385, 386. Section 4911 of the Revised Statutes provides, that if an applicant, except a party to an interference, is dissatisfied with the decision of the commissioner, he may appeal to the Supreme Court of the District of Columbia; and Section 4914 provides that the decision of that court shall govern the further proceedings in the case. Section 4915 also provides, that if the patent is refused, either by the commissioner or by the Supreme Court of the District of Columbia, the applicant may have remedy by a bill in equity, the details of which need not be further explained, except to say that, as we have already said, it was decided in Gandy *vs.* Marble, 122 U. S., 432. The two years' limitation found in Section 4894 applies to it.

There can be no question that the special and summary appeals thus provided for in behalf of an applicant for a patent, reach the case where a second patent is refused for the reason which, it is claimed in this case, renders the patent in issue void. Butterworth *vs.* Hoe, 112 U. S., 50, 63. The statute thus gives the applicant a remedy of a special and summary character, which he can avail himself of when all the facts are fresh and the parties cognizant of them are at hand. Of course, fraud always vitiates, and every special remedy is subject to that general rule; but to assume in this case jurisdiction to annul this patent for the reason we are now considering, is to deprive applicants for patents of resort to the special tribunal, under special and summary circumstances, given him by the statute. This we have no right to do, even though the same statute has not given the United States the same summary appeal. The proceedings in the Supreme Court of the District of Columbia are between the United States and the applicant, and, by express provision, do not preclude individuals interested to contest a patent. Those under Section 4915 have a like limited effect, although they may extend so far as to bar a person holding an alleged interfering patent. Thus Congress has established a special system, ending in a judicial determination, for the purpose of deciding, as between the applicant and the United States, the very issue now before us. We cannot disregard the implied command of the law that we shall not interfere, by any general rules of jurisprudence, with special rights thus expressly provided for. Orchard *vs.* Alexander, already referred to, on pages 385 and 386, recognizes this principle, in that it substantially declares that the statute provision to which we have just referred, deprives the Secretary of the Interior of the jurisdiction which he possesses with reference to proceedings in the General Land Office; and, by parity of reasoning, the same provisions likewise clip our jurisdiction.

A further examination of the statute brings out even a more positive conclusion touching this issue. Section 4916 of the Revised Statutes touching re-issues provides that "whenever any patent is inoperative or invalid" * * * * "the commissioner shall" * * * * "cause a new patent" * * * * "to be issued to the patentee," and so on. By the frame of this statute the jurisdiction of the commissioner depends

nominally on the fact that the patent is inoperative or invalid. As against alleged infringers, and as between alleged interfering patents, the statute has been strictly construed, so far as the powers of the commissioner are concerned, although we are not aware that any issue touching them has arisen as between the United States and a patentee. The expressions cited by the United States from Seymour *vs.* Osborn, 11 Wall, 516, 545, even if applicable to a suit in behalf of the United States, may well be understood to rest on the peculiar form of this section in this particular. But Section 4893, authorizing the original issue of patents, is framed in an entirely different manner, and reads :

> On the filing of any such application and the payment of the fees required by law, the Commissioner of Patents shall cause an examination to be made of the alleged new invention or discovery ; and if on such examination it shall appear that the claimant is justly entitled to a patent under the law, and that the same is sufficiently useful and important, the commissioner shall issue a patent therefor.

The language is quite positive in making the power of the commissioner to issue a patent dependent on the result of his own examination, that is, on facts as he finds them, and not on facts as they actually exist. Therefore it is not easy to understand how the determination and act of the commissioner in issuing any patent which, on examination as required by that section, seems to him to be suitable to be issued, can be *ultra vires;* though, as already said, there may be cases of such glaring error appearing on the face of the transaction as to be exceptional and outside of the ordinary rule.

In several late cases the nature and effect of the determination of the commissioner, based on this section, has been stated by the Supreme Court, although not in such connection as to directly settle the question we are now considering. In Morgan *vs.* Daniels, 153 U. S., 120, 124, a bill in equity resting on Section 4915, to which we have already referred, the court said that even a proceeding of that nature, expressly authorized by statute, was an application to the court to set aside the action of one of the executive departments; so that the proceeding was "something in the nature of a suit to set aside a judgment." In Orchard *vs.* Alexander, *ubi supra*, the court said on pages 378 and 379 that, although the action of a department in a matter of this nature was executive, at the most only quasi-judicial, and not a purely judicial act, yet such a determination may be made by statute final and conclusive. In Boyd *vs.* The Jaynesville Hay Tool Company, 158 U. S., the court applied these principles to the question of the identity of different patents issued by the Patent Office. In none of these cases were the United States a party, and expressions of this character cannot always safely be exchanged from opinions filed in suits between individuals to suits of the character at bar, and the reverse; yet they all indicate generally the nature of a finding of the Commissioner of Patents as the result of the examination which the statute provides shall be made by him. In land grant cases to which the United States have been a party, the rule has been laid down in the broadest and strongest terms. In United States *vs.* Marshall Silver Mining Company, 129 U. S., 579, 588, the court, referring to the officials of the Land Department, said as follows:

> If the officers of that department of the government have acted within the general scope of their power, and without fraud, the patent which has issued after such proceedings must remain a valid instrument, and the court will not interfere, unless there is such a gross mistake or violation of the law which confers their authority as to demand a cancellation of the instrument.

In United States *vs.* California and Oregon Land Company, 148 U. S., 31, 43, the court fully reaffirmed this statement of the law. In The Corporation of the Catholic Bishop of Nesqually *vs.* Gibbon, 158 U. S. the court finally laid down the broad rule that "in the administration of the public lands, the decision of the Land Department upon questions of fact is conclusive, and only questions of law are reviewable by the courts." That the court intended this to cover issues between the United States and patentees is plain, because it cited in support of this proposition numerous cases of that character.

We have shown that the action of the commissioner, so far as this issue we are now considering is concerned, was merely a finding of the ultimate facts from other facts, all of which were known to the officials ; and the principle which we thus use in the interpretation of Section 4893 is one of very general application. It is illustrated in numerous departments of the law, where acts are done by public or corporate officials, as the result of investigations authorized to be made by themselves, none more noticeable than in the great mass of municipal and other public bonds, which have been supported by the courts on the strength of the certificates of local officers, directed to make findings of the preliminary conditions required by statute. We think its application to this case makes it clear that, with the possible extreme exceptions which we have characterized, the statute vests in the Commissioner of Patents authority to issue all such patents as on examination he deems proper to issue, that none thus issued are issued *ultra vires*, that all such are within the scope of his powers within the meaning of the expressions we have cited from the Supreme Court, and that there is nothing in this case which excepts it from this general rule.

But we have pursued the matter already further than was necessary. It is clear, on this part of the case, that we are barred from taking jurisdiction by reason of the statute provisions which give special remedies to an applicant whose patent is refused, and, passing by this, that also the issue of this patent was within the scope of the authority of the commissioner, and no mistake being proven, and no other equitable ground appearing, we cannot revise his action in this suit.

The United States has filed a motion in this court, praying that if we find for the appellants, we will reserve leave to the Circuit Court to permit an amendment at bar, alleging that the American Bell Telephone Company did directly agree with the representatives of the Drawbaugh application that the determination by the Patent Office of the question of priority should abide the decision in The Telephone Cases, that these parties, acting in concert, did procure the Commissioner of Patents to consent to such postponement, and that thus the American Bell Telephone Company, by its own act, procured the postponement of the decision of priority, without necessity or right, in violation of its duty to speed the patent for the microphone. We have already found that, as the record now stands, it contains no proof to sustain an allegation of this character. Therefore, an amendment of this nature would require the opening of the record below for further proofs. It is not at all a case where a complainant has proved his case, but his allegations are found by the appellate court to be inapt. To grant this motion would under the circumstances violate all the rules requiring diligence from parties complainant.

The decree of the Circuit Court is reversed, and the case remanded to that court with directions to dismiss the bill.

Anti-Bell Meeting.

The Telephone Protective Association of America, J. E. Keelyn, of Chicago, president, will meet in Pittsburgh on Monday, June 24. The Hotel Duquesne will be headquarters.

Increased Facilities for the Weston Electrical Instrument Company.

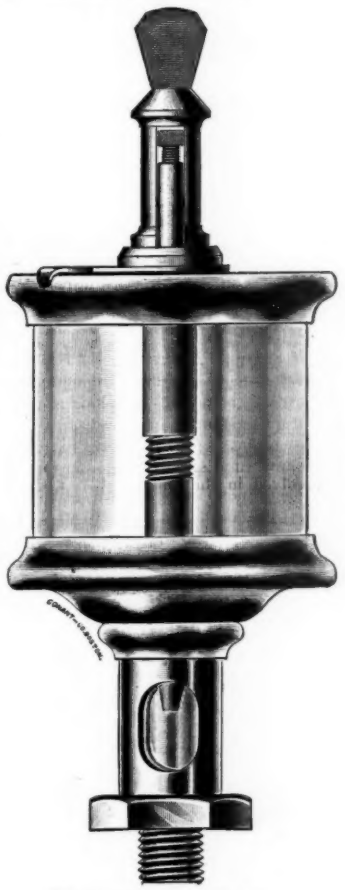
The Weston Electrical Instrument Company, of which Prof. Edward Weston is the moving spirit, has found its quarters too contracted in the building at the corner of William and Shipman streets, Newark, N. J., and has arranged for an extensive plant at Waverly, N. J. The company has purchased about 48 acres of land on both sides of Frelinghuysen avenue for the purpose, the last purchase of a little more than 23 acres being concluded last week with William R. Ward, executor of the Meeker estate, which lies on the west side of Frelinghuysen avenue north of the road to the gates of the fair ground and runs back into the cove. This will be opened up in building plots for employés of the works, and the property will be rented or sold upon easy payments to the employés of the company. About 100 cottages will be built upon this tract by the company. It is expected that active building operations will be commenced in September.

Governor Rich has vetoed the bill making an appropriation of $25,000 to the Michigan State University for an electric light plant.

A New Oil Cup.

Wm. H. Wilkinson & Company, 352 Atlantic avenue, Boston, Mass., manufacturers of a well-known line of oil distributing and automatic wiping devices, have just placed upon the market a new oil cup illustrated herewith. A common objection to many adjustable feed oil cups is that the adjustment is secured by either a jam nut, set screw, or some kindred mechanism, and that this adjustment is likely to become changed by the jar of the engine or machine loosening the nut or screw, which of course destroys the practical benefit of the device.

Messrs. Wilkinson & Company claim to have overcome the possibility of anything of this kind occurring in their new oil cup. The feed is



WILKINSON'S NEW OIL CUP.

regulated by a square-headed screw ; this screw is fine threaded enough to make any adjustment desired, however close, and finds its internal bearing on a pin which passes midway through a slot cut in the valve spindle, and when the lever is raised to an upright position to start the flow of oil the slot in the lever engages the square of the screw and absolutely secures it, and the feed can only be changed by throwing the lever down and exposing the screw for any desired alteration in the feed. It is not necessary to use either a screwdriver or wrench in setting the adjustment. The screw can be turned with the hand. The lever is also constructed so that by setting it at an angle of 45 degrees, the oil will run a stream, thereby providing ample means for flushing the bearing.

There will probably be an electric light bicycle race meeting at Wilmington, Del., in July.

Electricity for New York Elevated Roads.

The daily papers last week published dispatches from Pittsburgh asserting that General Manager Hain, of the Manhattan Railway Company, New York, had signed a contract for the electrical equipment of the system by the Westinghouse Electric and Manufacturing Company. An ELECTRICAL REVIEW representative found President George Westinghouse and Secretary Charles A. Terry at the New York offices of the Westinghouse company. They gave out the following official statement referring to the dispatches from Pittsburgh:

"This statement is premature. For the past two years conferences have been going on constantly with reference to this work, but action has been delayed on the advice of the Westinghouse company pending the perfection of the forms of motors to be operated under the Tesla inventions, it being now conceded that motors of this character, owing to their superiority will supplant the earlier kind of motors. The Manhattan officials believe that the Westinghouse people have the exclusive right to manufacture apparatus under the Tesla patents and are now giving the matter their especial attention."

It is reported that Mr. Hain and other Manhattan railway officials will visit Chicago to inspect the electrical equipment of the Metropolitan West Side Elevated Road, installed by the General Electric Company, before the contract for the New York elevated roads is awarded. At any rate, the electrical equipment of the New York roads, by one or both of the companies named, appears to be not far distant.

Mr. Yerkes Interested in the Siemens & Halske Company.

The news comes from Chicago that Mr. Charles T. Yerkes and the eastern capitalists associated with him in street railway and other enterprises have secured a controlling interest in the Siemens & Halske Electric Company, of America. This company has bought the extensive plant of the Grant Locomotive Works in Cicero, where it moved after being burned out last year. The business will be expanded into one of the largest manufacturing plants of the kind in the country. To make this purchase and enlarge its business the company had to increase its capital stock from $1,000,000 to $2,000,000.

OBITUARY.

Johns Hopkins, 37 years old, president of the Hestonville, Mantua & Fairmount Passenger Railway Company, died at Philadelphia on June 7. The causes of death were exhaustion from a 15-mile bicycle ride on Memorial Day, and a severe fall on June 7 producing a hemorrhage. Mr. Hopkins was one of the best known and most popular of Philadelphia's young business men and was a first cousin and namesake of the famous Johns Hopkins, who founded the university to which he gave his name in Baltimore.

ADVANCE INFORMATION.

VALUABLE INFORMATION FOR MANUFACTURERS AND DEALERS.

We publish below the earliest information obtainable relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW from week to week.

Increase of Capital Stock.

WASHINGTON, D. C.—Brott Electric Bicycle Company has amended its charter, changing its name to the Brott Rapid Transit Company, and increasing its capital stock to $3),000,000.

CHICAGO, ILL.—Siemens & Halske Electric Company of America certified to an increase in capital stock from $1,000,000 to $2,000,000.

CHICAGO, ILL. — Chicago Electric Light Enlarging Company certified to an increase in capital stock from $5,000 to $15,000.

Business Troubles.

MONTGOMERY, ALA.—Judge Arrington has ordered the foreclosure of a mortgage on the Montgomery, West End & Riverside Electric Street Railway Company in favor of the State Trust Company, of New York, the trustees of the majority of the $100,000 bonds of the company.

NEW ORLEANS, LA.—The United States Electric Securities Company, of Portland, Me., filed an application in the United States Circuit Court for the appointment of a receiver for the Louisiana Electric Light Company. This company is a large corporation and has practically a monopoly of the electric light and power business in this city.

BOSTON, MASS.—Harvey K. Flagler, promoter, and George A. Whitmore, electrical engineer, both of this city, are petitioners in insolvency.

New Manufacturing Companies.

MARIETTA, GA.—The Marietta Electric Company has been incorporated by D. N. Anderson, G. F. Gober, A. S. Clay and others, to manufacture and sell electric light and power, etc. Capital stock, $10,000.

PORTLAND, ME. —The Bay State Pneumatic Delivery Company has been organized for the purpose of manufacturing and dealing in pneumatic tubes and electric devices of all description, with $500 000 capital stock. The officers are: President, G. M. Woodward, of Taunton, Mass.; treasurer, George C. Morrill, of Boston.

NEW YORK, N. Y.—Tilmann Portable Electric Light and Reflector Company has been incorporated; capital stock, $100,000. Directors, Horace A. Ockershausen, John J. Lawler, Timothy A. Fay, John McCarthy and Paul Brunel.

CHICAGO, ILL.—American Signal Company has been incorporated; capital stock, $100,000. To manufacture electrical appliances. Incorporators, Charles C. Arnold, Joseph P. Eames, John T. Bailey.

New Telephone and Telegraph Companies.

STATESVILLE, N. C.—E. C. Hein, of Ridgeway, S. C., will construct telephone system in Statesville.

NEODESHA, KAS.—The Neodesha Telephone Company has been incorporated with a capital of $5,000. The incorporators are: G. N. Bandy, W. I. Pierce, W. S. McGhee, R. P. Carpenter and W. L. Blakely.

LOOMIS, N. Y.—Steps are being taken to build a new telephone line from this place through Pines Brook to Walton.

JEFFERSON, N. Y.—An exchange says that a telephone line is to be placed between this place and Gilboa in the near future.

New Electric Railways.

CANFIELD, OHIO.—The city will vote $2,000 worth of bonds to aid in building an electric railroad to youngstown.

ST. LOUIS, MO.—The Chicago & St. Louis electric railway, which is being built between St. Louis and Chicago, and of which Washington Adams is the general manager, will place $9,000,000 worth of bonds, all to be sold in this county,and will be bought in St. Louis, New York and Chicago.

ASHLAND, MO.—An electric railway from Ashland to Mexico, and passing through Englewood, is reported.

MOUNDSVILLE, W. VA.—The Moundsville, Benwood & Wheeling Railway Company has been incorporated by J. W. Burchinal, M. F. Cox and others. Capital stock, $250,000.

DALLAS, TEX.—The Dallas City Street Railway Company has been incorporated by Frank P. Clark, of Baltimore; J. L. Sale, of Dallas; and others. Capital stock, $500,000.

PRINCESS ANNE, MD.—An electric line will probably be built from Princess Anne to Deal's Island. The distance is about 10 miles. T. Bock and others are interested.

LITTLE ROCK, ARK. — J. H. Healy and others have asked for franchise to construct an electric line along several of the city streets.

GAINESVILLE, GA.—D. E. Evans and others are organizing a company to build an electric line in the city and suburbs.

INDIANAPOLIS, IND.—Indianapolis, Anderson & Marion Railway Company has been incorporated by M. J. Clodfaller, of Crawfordsville; V. C. Quick, of Alexandria; and others. Capital stock, $500,000.

ATLANTA, GA.—The property of the Atlanta Traction Company has been sold at auction to a Baltimore syndicate for $150,000.

CHICAGO, ILL.—The Suburban Electric Company, recently organized, announces that it will build an electric line to Riverside.

BELFAST, ME.—The subject of building an electric railway to run parallel with the river is being agitated.

WESTPORT, CONN.—The street railway company has decided to equip its l nes with electric power and to discard horses.

JACKSON, MICH.—The street car line is to be extended to Vandercook's lake at a cost of $35,000.

CINCINNATI, OHIO.—R. J. H. Archible, John Rempy and others are among the incorporators of a new company who are going to construct an electric line from the end of the Norwood or Hyde Park lines to the Oakley race tracks. Capital stock of the company, $10,000.

BOSTON, MASS.—The Little Rock Traction and Electric Company has been organized, with Allen N. Johnson, president; George B. Rose, secretary; and Charles F. Pennel, treasurer. It is composed principally of the United Electric Securities Company, of Boston, and the General Electric Company, of New York, and St. Louis local companies. It will control all of the street railway lines of the city of Little Rock.

DALLAS, TEX.—Dallas Street Railway Company has been incorporated by F. P. Clark, of Baltimore; G. L. Blackwood, of Denison; and J. L. Salle. Capital stock, $500,000.

XENIA, OHIO.—Springfield, Clifton, Cedarville & Jamestown Electric Railway Company have filed articles of incorporation.

BATESVILLE, IND.—The Batesville & Oldenburg Railroad and Electric Company has been incorporated to build an electric line from Oldenburg, Franklin county, to Batesville, Ripley county. The capital stock is $50,000. The board of directors: Kendall M. Hord, Bellamy S. Sutton, Eward K. Adams. John A. Tindall, Jonas Joseph, of Shelbyville; John Hilder-Grand, of Batesville; and Augustus A. Harkman, of Oldenburg.

Electric Light and Power.

LEXINGTON, KY.—The Mayor can give information concerning electric light plant, bids for which are now being invited.

WOODWARD, OKLA.—The Woodward Water, Heat and Power Company has been incorporated by A. G. Cunningham, John M. Pugh. Capital stock, $25,000.

MERAMEC HIGHLANDS, MO.—The franchise of the Sunset Hill Water, Light and Power Company has been purchased by the Meramec Highlands Company, and will construct works to supply a number of towns in St. Louis County between Meramec Highlands and St. Louis. Marcus Bernheimer, president.

DEPOSIT, N. Y.—The Deposit Electric Light Company has decided to enlarge its plant and purchase a new engine, boiler and electric machinery.

CHICOPEE, MASS.—The property committee of this city has voted to recommend to the City Council to build and equip a plant to furnish its own electric lights. A carefully prepared plan of the building and dynamos and power has been submitted.

LEBANON, PA.—The Pennsylvania Bolt and Nut Company will shortly introduce powerful electric lights in and about their works.

DURAND, MICH.—An electric light plant is to be established here at a cost of $10,000.

BARTON, VT.—The town has voted to issue bonds to the amount of $10,000 to establish an electric light plant.

MILES CITY, MON.—Bonds are to be issued to purchase electric light plant and waterworks that supplies the town, and is now owned by a private corporation.

LEXINGTON, KY.—K. T. Duncan is inviting bids until June 26, for lighting the streets with gas or electricity, or both, on a five or ten years' contract after October 31, 1895.

MASON, MICH.—A. F. Meehan is inviting sealed proposals until June 17, for the construction of the necessary envine, arc and incandscent dynamos, arc lamps, converters, poles, lines, etc., for an electric light plant.

SAN FRANCISCO, CAL.—The San Francisco Gas Light Company has decided to build an electric light plant to supply this city with arc and incandescent light and electrical power. The new plant will cost about $2,000,000.

ELLSWORTH, KAS.—The Pohlman Electric Light Company are putting up telephones.

TRUMANSBURG, N. Y.—Trumansburg Electric Light Company has been incorporated by C. C. Sears, A. S. Mosher, and others. Capital stock, $10,000.

CHICAGO, ILL.—Hammond Lighting Company, incorporated by William B. Engel, C. F. Griffin and M. E. Barnhart. Capital stock, $210,000.

LANSINGBURGH, N. Y. — George Gramm, village clerk, is inviting proposals for lighting the village by electricity.

NEWARK, N. J. — The Newark Electric Light and Power Company has been sold to Philip N. Jackson and B. M. Shanley, of Newark. The authorized capital is $1,000,000, but the total stock issue is only $825,000.

RADIOPHONY.

ABSTRACT FROM A PAPER BY MR. SEMMOLA, READ BEFORE THE ROYAL SOCIETY OF ENCOURAGEMENT, NAPLES.

For many years I have desired to try the effect of a rapidly intermitted light ray upon the moveable contacts or electrodes of a carbon transmitter. Of course, in performing this experiment care should be taken to prevent the heat effect from becoming so intense as to injure the instrument. The problem I have desired to solve was: Does or does not the intermittent light beam vibrate moveable carbon electrodes, producing thereby sound in a telephone included in circuit with the microphone? Owing to the lack of time and proper experimental facilities, I have not been able to carry out this special experiment, and have been obliged to limit my investigation to the effect of intermittent light radiations upon a mass of powdered carbon.

In my investigation I have employed M. d'Argy's transmitter, which consists of a small cylindrical metal box, eight centimetres in diameter. The shape of this microphone is an exact limitation of the mercury containing chamber of an aneroid barometer, and is filled to about three-quarters of its depth with granulated carbon. To each cover of the box is attached, but carefully insulated therefrom, a small carbon cylinder, or plunger, which projects into the mass of carbon. The terminals *a*, *b* are connected, as usual, with a telephone and battery.

Having thus briefly described the d'Argy transmitter, I will now describe my experiments:

Through a small circular opening of the darkened window, I cause a beam of sunlight to enter. At a distance of a few metres it passes a biconvex lense, placed in the front, or lid of a box or chamber, whose rear wall contains the microphone. A minute but very luminous image *d* is thus thrown upon the front disk of the transmitter. The diameter of the lense I employ is 10 centimetres with a focal distance of 22 centimetres. After its entrance into the room, the ray is led through an interrupter, consisting of a rotatable paper disk of 75 centimetres diameter, circumferentially perforated with eight equi-distant holes.

A slow revolution of the interrupter produces at once a gentle breathing sound in the telephone attached to the microphone, and this sound is repeated at each interruption of the light. It is not necessary at all to employ the disk, for a distinct sound will be observed by suddenly cutting off the light with the hand. At a certain speed of the disk, the sound greatly increases and becomes a nearly continuous tone, but by further increasing the speed the sound dies away slowly. It is evident that the thermal rays of the sunlight produce these audible effects, for blackening of the front cover of the microphone greatly assists the success of the experiment,

while on the other hand, the interposition of a solution of alum, or even pure water, prevents the acoustic phenomena. In other words, it appears that each time the ray strikes the metal cover of the microphone, it causes contractions and expansions of the *entire* body, thus vibrating the carbon granules and producing the above-mentioned sounds.

I then raised the question whether these vibrations are transmitted to the granules directly through the instrumentality of the metal cover (*i. e.*, the entire mass of the plate being thrown into vibration), or whether the latter transmits its vibration to the carbon cylinder attached thereto, which, in turn, agitates the mass of carbon.

To answer this important question, I have performed a great many experiments, but I will cite here only one which, it seems to me, is conclusive. I constructed a cylindrical box, somewhat larger than the d'Argy transmitter, filling its inside to about three-quarters of its depth with carbon granules. The body of this box consists of an ebonite ring, three millimetres thick, closed on both sides by a thin metal disk. This microphone is attached to a slanting wooden board and is placed in circuit with a battery and telephone, and, of course, acts as a very efficient articulating microphone.

As I obtained all the above described phenomena with this simple device, I believe I am fully justified in stating that the light beam expands and contracts the *entire* disk, and that these molecular vibrations are then transmitted to the carbon granules, causing the sounds in the telephone. While being engaged in this investigation I heard of the new Hunnings transmitter, manufactured by the Antwerp Telephone Company, which is used in the telephone exchange of Naples. [This transmitter is patented in Great Britain to a Mr. Goffin, of Brussels.—ED. REVIEW.]

This instrument consists of a solid carbon disk (one by three centimetres) having five perforations (each six milimetres in diameter) filled with powdered carbon.

The characteristic feature of this instrument is the arrangement of its diaphragms, which are so constructed that, while the rear one is in perfect contact with the solid carbon disk, the front plate is about one tenth of a millimetre distant therefrom, and thus the carbon granules can move freely in this open space, and contact with the front diaphragm. Of course, both plates are connected with a battery and the primary of an induction coil, while the telephone is included in the secondary circuit. This instrument forms a very efficient transmitter for long-distance lines. On account of its great sensitiveness, it appeared to me peculiarly well adapted for my investigation, and indeed, employing it in place of the d'Argy microphone, I at once observed a distinct sound in the telephone.

I desire to emphasize here the point that these phenomena are produced by heat rays, and that the microphone operated as a thermophone. I am well aware of the publications of Messrs. Bell, Tyndall, Preece, Tainter, Mercadier, etc., bearing on this question. It has been admitted that gases and vapors, acted upon by intermittent light radiations, acquire vibratory sonorous movements, but many physicists have denied the fact that a solid body can be thrown thereby into mechanical vibrations. After a prolonged controversy, Mr. Mercadier, I believe, in 1885 proved the correctness of this opinion. My experiments demonstrate that a metal disk, acted upon by intermittent radiations, contracts and expands so that, omitting the intermediary transformations, it may be said the microphone is a transformer of radiant thermic into radiant sonorous energy.

KIND WORDS.

"EVERYWHERE."

The manager of the largest electrical supply house in the great West writes to the ELECTRICAL REVIEW as follows under date of June 12, 1895:

"It may interest you to know that our Southern representative speaks very highly of the REVIEW in his territory. He says that he sees the 'yellow cover' almost everywhere."

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The destruction of our Works by fire on April 7th was almost complete.
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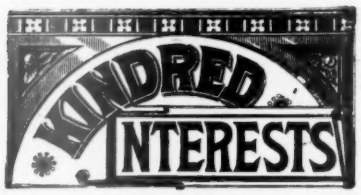

The American Carbon Company has removed its offices from Dayton, Ohio, to its factory at Noblesville, Ind.

The Central Electric Company, of Chicago, has been made western agent for the Billings & Spencer drop forgings and overhead trolley fixtures.

The Central Electric Company, 173-175 Adams street, Chicago, has issued a very attractive circular illustrating and describing Lundell and Holtzer-Cabot fan motors for all currents and voltages.

The Law Battery Company, 39 and 41 Cortlandt street, New York, has issued a new catalogue divided into two sections. Part 1 is devoted to the general trade and part 2 describes the apparatus manufactured by the company for electro-therapeutic uses. The old reliable Law double cylinder battery is fully illustrated and described.

The West End Street Railway, of Boston, has recently placed an order with the General Electric Company covering two 800-kilowatt, two 1,300-kilowatt and one 1,500-kilowatt generators, all to be directly connected to the engines. This is one of the largest orders for railway generators ever placed at one time and was secured on the merits of the machines only.

The Metropolitan Electric Company, 186–188 Fifth avenue, Chicago, has secured an order for its portable fire hose bridge from the Chicago Transit Company, who, recognizing the merits of this device, have decided to equip their lines with it, also reports a good demand for its various first-class specialties, such as the P. & B. products, solar arc lamps, N. I. R. wire, Dayton ceiling fans, Keystone instruments, etc.

Henry Charles Euler, 513 Broadway, New York, is introducing a line of most attractive novelties to the electrical field in the way of pearl trimmings, such as push buttons, small handles, knobs and plain and fancy designs. He represents a large pearl factory, which has recently so perfected the making of pearl that these pieces can be manufactured, costing no more than cheaper goods of hard rubber and wood, and the factory is especially equipped for the electrical trade.

Standard Dynamos and Lamps.—The Cincinnati Edison Company have just placed an order for four more 80-light Standard arc dynamos and Standard lamps. After the severe tests given the thirty-two 50-light Standard arc machines previously purchased, and the remarkable record made by the machines in the matter of no repairs to speak of, it must certainly be gratifying to the Standard Electric Company to receive so plain a proof of the advisability of using Standard apparatus.

A. Chisholm & Company, Bay City, Michigan, manufacturers of the "Peerless" commutator compound, report large sales of their product in all parts of the country. Among many flattering testimonials received is one from Chief Engineer Frank Conroyd, of the Cook County Court House, Chicago, who writes: "We find your 'Peerless' commutator compound is far superior to anything we have ever used." Mr. Maila, at Armour & Company's Union Stock Yards, Chicago, says: "We have one dynamo especially which we have not been able to use anything on till we tried your 'Peerless' compound." Many station engineers, dynamo tenders and electricians claim that this compound is the best commutator lubricant they have ever used.

Mr. Wilfrid H. Fleming, of 393 Pearl street, the woven wire dynamo brush manufacturer, has just returned from Europe after an absence of a few weeks. He has made arrangements for manufacturing his brush with parties under his British patent, a large number of orders already having been placed.

The outlook for the Summer and Fall trade in this country is bright; many factories that have been working only on half time, with the increase of business are now working overtime on purpose to catch up with orders, consequently are using their dynamos for light, and thereby need a superior brush. We are told that Mr. Fleming has orders on his books from nearly every State in the Union, and that he has yet to hear of his brush giving unsatisfactory results.

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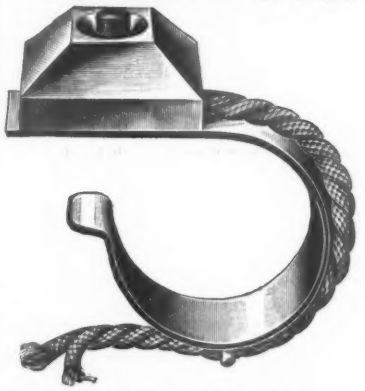

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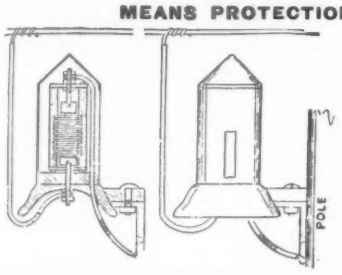

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